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VELISCOL CHEMICAL CORPORATION

21

**CONTRACT DOCUMENTS
and
SPECIFICATIONS**

**Securement of Plant Site
PHASE I
St. Louis, Michigan**

**DRAFT
FOR REVIEW**

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and
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**Securement of Plant Site
PHASE I
St. Louis, Michigan**

January, 1983

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FOR AN ACCEPTANCE RESPIRATOR PROGRAM

APPENDIX B BOREHOLE LOGS

INFORMATION FOR BIDDERS

B. 01 DATE AND PLACE FOR SUBMITTING BIDS

Sealed Bids will be received on behalf of Velsicol Chemical Corporation (herein called the Owner) by Conestoga-Rovers & Associates Limited, 651 Colby Drive, Waterloo, Ontario, Canada, N2V 1C2.

until 3:00 p.m., local time, _____, 1983.

Each Bid must be submitted in a sealed envelope, addressed to Mr. T.W. Shaffer, Manager of Environmental Engineering, Velsicol Chemical Corporation, c/o Conestoga-Rovers & Associates Limited, 651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2. Each sealed envelope containing a bid must be plainly marked on the outside as Bid for "Securement of Plant Site, Phase I, St. Louis, Michigan", and the envelope should bear on the outside the name of the Bidder and his address.

The Bid must be signed by an officer of the Company, designating the position and executed with the Company Seal.

In the case of an individual trading as a Company, the signatures of the person signing the Bid must be witnessed.

B. 02 SCOPE OF WORK

The work comprises the installation of 2,100 lineal feet of 21"Ø and 18"Ø storm sewer adjacent to the Plant Site south east boundary fence line; installation of approximately 39,000 square feet of an impervious continuous bentonite soil containment wall along the easterly boundary side of the Velsicol Plant Site; construction of a 3 foot thick clay cap over the north east 15 acres of the Plant Site; and construction of an internal groundwater collection system below the area to be capped as part of Phase I. The work also includes the provision of temporary on-site plant and facilities related to health and safety.

B. 03 ENGINEER

The Engineer is Conestoga-Rovers & Associates Limited. Their address is 651 Colby Drive, Waterloo, Ontario, Canada, N2V 1C2.

B. 04 BID DEPOSIT

Each Bid must be accompanied by a Bid Bond executed by the Bidder as Principal and having as surety thereon a surety company acceptable to the Owner, any of which must be in an amount not less than five percentum (5%) of the amount of the base bid listed in the Form of Bid. Such security will be returned to all except the three (3) lowest formal Bidders within ten (10) days after the formal opening of Bids, and the remaining cash, checks or Bid Bonds will be returned to the three (3) lowest Bidders within forty-eight (48) hours after the Owner and the accepted Bidder have executed the Contract, or if no Contract has been executed within

(60) days after the date of opening of Bids, upon demand of the Bidder at any time thereafter, so long as he has not been notified of the acceptance of his Bid. A certified cheque may be substituted for the Bid Bond requested.

B.05 EXAMINATION OF SITE

Each Bidder shall visit the site of the work before submitting his Bid and shall satisfy himself by personal examination as to the local conditions to be met with during the construction and conduct of the work. The Bidder is not to claim at any time after submission of his Bid that there was any misunderstanding of the terms and conditions of the Contract related to the site conditions.

B.06 PRE-BID MEETING

A Pre-bid Conference will be held at _____ a.m. on _____, 1983, in St. Louis, Michigan at the site offices, 701 West Washington Ave., St. Louis, Michigan, 48880. Representatives of the Owner and Engineer will be in attendance to discuss the proposed methods of complying with the requirements of the Contract Documents. A visit to the site of work and the Project borrow pit will also be included as part of the Pre-bid Conference.

The Pre-bid Conference is mandatory for all prospective bidders, and bids received from companies not attending the Pre-bid Conference will be returned by the Owner unopened.

An Addendum will be issued containing the proceedings of the conference and a list of Contractors will be eligible to bid.

B.07 OMISSIONS, DISCREPANCIES AND INTERPRETATIONS

Should a Bidder find omissions from or discrepancies in any of the Bid Documents or should he be in doubt as to the meaning of any part of such Documents, he should notify the Engineer, preferably in writing, and not later than five (5) days before the closing date for Bids. If the Engineer considers that a correction, explanation or interpretation is necessary or desirable, he will issue an addendum to all who have taken out Bid Documents and all Bidders shall include the requirement of the addenda in Bids to be submitted for consideration.

Should the Bidder not agree that the materials and methods specified, or designed on the Drawings, will provide an installation to meet the requirements of the project, he shall notify the Engineer in writing stating his reason for objection and may submit a suggested alternative. In such event, the Engineer will make the final decision in selecting the alternative to be implemented.

B. 08 FEEES, PERMITS, LICENSES

The Contractor shall be responsible for obtaining all permits and the licenses required in the performance of the work and shall include the cost of permits, licenses and inspection fees or other charges made by concerned authorities in his total Bid price.

B. 09 JURISDICTION

Applicable Federal and State laws, municipal by-laws, permits and the rules and regulations of all authorities having jurisdiction over construction of the work shall apply to this Contract throughout and such laws, by-laws, permits and rules and regulations will be deemed to be included in this Contract as though written in full herein.

B. 10 AGREEMENT TO BOND

Every Bid shall be accompanied by an "Agreement to Bond" which shall be completed by a Surety Company lawfully doing business in the State of Michigan.

B. 11 BID LEFT OPEN

The Bidder shall keep his Bid open for acceptance for sixty (60) days after its submission.

B. 12 COMMENCEMENT AND COMPLETION

Bidders shall be prepared to commence work within seven (7) days of being given written notice by the Engineer to proceed and to continue in an expeditious manner and to complete substantially all the work in accordance with the Contract requirements.

B. 13 EQUIVALENTS

When equipment or materials to be supplied under the Contract are specified by their trade or other name, the Bidder may base his bid price on the supply of the named materials or equipment or an approved equal, subject to written approval by the Engineer of the alternate equipment or material

Prior to submission of bid, the Contractor may submit requests to the Engineer for substitution of equivalent material. Such submissions shall be accompanied by complete information on the material proposed for use.

The Engineer will review the request and give notice of its decision to the Contractor.

B. 14 ALTERNATE CONSTRUCTION PROCEDURES

Experience gained during execution of similar projects has been reflected in construction procedures suggested on the Contract Drawings. The Bidder shall submit his Bid based on the construction procedures suggested. The successful Contractor may submit alternate construction procedures for approval, to the Engineer, within one (1) week of the notification of award of the Contract. Appropriate cost adjustments in the Contract price will be negotiated prior to the Engineer granting approval of such alternatives.

B. 15 AWARD OR REJECTION OF BIDS

The Contract will be awarded to the lowest responsible bidder complying with the conditions prescribed, provided his bid is reasonable and it is to the interest of Velsicol to accept it. The Bidder to whom the award is made will be notified promptly. Velsicol reserves the right to make awards in accordance with any of the bidding items, to reject any and all bids, and to waive any informality in bids, whenever such is in the interest of Velsicol. Velsicol reserves the right to require, prior to the award of the Contract, a statement of facts in detail of the business and technical organization and plant of the Bidder available for the contemplated work, including financial resources and experience of the organization in construction of comparable work. Subject to the right of Velsicol to reject any or all bids which are not in the best interest of Velsicol, an award will be made to the bidder submitting the lowest bid.

B. 16 RESULTS OF BIDDING

All bidders will be notified concerning their bid, whether accepted or rejected, within a reasonable time following the time of opening. A written notice of award, if any, will be delivered to the selected bidder within sixty (60) days of opening of bids.

shall and will accept such modifications when ordered in writing by the Engineer, and the same shall not vitiate or void this Contract. Any such modifications so made shall not, however, subject the Contractor to increased expenses without equitable compensation. If such modifications result in a decrease in the cost of work involved, an equitable deduction from the Contract price, to be determined by the Engineer on the basis of unit prices Bid and accepted, shall be made.

The Owner may make alterations in the line, grade, plan, form, dimensions or materials of the work, or any part thereof, either before or after the commencement of construction. If such alterations diminish the quantity of work to be done, no claim for damages or for anticipated profits on the work dispensed with shall be warranted thereby or claimed therefor; and if they increase the amount of work, such increase shall be paid for according to the quantity actually done at the unit prices bid for such work under this contract, or in case there is no price established it shall be paid for as extra work in accordance with Section Fb. 04 of the Form of Bid.

The Owner will not accept any modifications that significantly changes the dimensions or appearance of any structure. If, however, the Contractor requests permission to use manufactured equipment that would necessitate changes in the interior layout of a structure such as the relocation of equipment, structural supports, platforms, access, and similar components, the Owner reserves the right to grant such permission. If permission for such modifications is granted, the Contractor shall be responsible for all resulting revisions. He shall be responsible for and pay the cost of the preparation of revisions in plans and the cost of any additional construction occasioned by the requested revisions. In the preparation of the revised plans, clearance access, walkway widths, headroom and other structural and equipment layout features shall be equal to those shown on the original Plans. All materials involved in the redesign shall conform to the applicable provisions of the Project Specifications.

Any modifications in work required under other contracts to accommodate the changed design will be incorporated in the appropriate Contracts and any resulting increases in contract prices will be deducted by the Owner from payments otherwise due the Contractor who initiated the changed design.

Fb. 04 PAYMENT FOR EXTRA WORK AND CREDIT FOR DELETIONS

The Contractor shall and will do any work and furnish any materials not herein provided which, in the opinion of the Engineer, may be found necessary or advisable for the proper completion of the work or the purposes thereof, or any modification or alterations. All extra work and materials shall be ordered in writing by the Engineer, and in no case will any work or materials in excess of the amount shown by said Plans and Specifications be paid for unless so ordered. The Contractor further agrees that he will accept as full compensation for such extra work and materials the unit prices Bid, in the case of items covered by unit prices in the proposal, and no more; and for such items as are not covered by a unit price, he will accept as full compensation the unit price or lump sum price agreed to by him and the Engineer.

Where there are no applicable unit prices for extra work ordered pursuant to this Specification and agreed prices cannot be readily established or substantiated, the Contractor shall be paid the actual and reasonable cost of:

1. Necessary materials (including transportation to the site). Materials used, if acquired by direct purchase, must be covered by receipted bills or acceptable invoices. All prices on used material incorporated in either temporary or permanent work shall be billed at a fair value, less than the original cost when new. A reasonable salvage credit shall be given for all salvagable material recovered. Salvage value of substantial material recovered must be determined jointly by the Contractor and the Engineer; plus
2. Necessary direct labor charges. Each class of labor shall be billed separately, preferably at actual payroll rates. Average rates based on different classes of labor, will not be accepted; plus
3. Payment required to be made to labor organizations under existing labor arrangements; plus
4. Sales taxes as required by law; plus
5. Equipment and plant rentals, other than small tools, as follows:

The base hourly rates shall be the daily rate as listed in the current Blue Book divided by eight (8).

The first twenty (20) hours will be paid at 90% of the above base hourly rate.

For twenty-one (21) to forty (40) hours, the rate will be 80% of the above base hourly rate.

For over forty (40) hours, the rate will be 45% of the above base hourly rate.

To each of the above rates, the estimated hourly operating cost, as listed in the Blue Book, shall be added.

The number of hours to be paid for shall be the number of hours that the equipment or plant is actually used on a specified force account.

Equipment to be used by the Contractor shall be specifically described and be of suitable size and suitable capacity required for the work to be performed. In the event the Contractor elects to use equipment of a higher rental value than that suitable for the work, payment will be made at the rate applicable for the suitable equipment. The equipment actually used and the suitable equipment paid for will be recorded as part of the record for force account work. The Engineer shall determine the suitability of the equipment. If there is a differential in the rate of pay of the operator of oversize or higher rate equipment the rate paid for the operator will likewise be that for the suitable equipment.

In the event that a rate is not established in "The Blue Book" for a particular piece of equipment or plant, the Engineer shall establish a rate for that piece of equipment or plant that is consistent with its cost and use.

It is mutually understood that the base daily rates include all costs incidental to equipment and plant rentals including cost of moving to and from the site; plus

6. Fifteen percent (15%) of the total material cost (Bare Cost F. O. B.) and direct labor cost (actual hours worked multiplied by regular hourly wage rates) as compensation for profit and overhead.

If any of the work is performed by a subcontractor the Contractor shall be paid the actual and reasonable cost of such subcontracted work computed as outlined above or on such other basis as might be approved by the Engineer, plus an additional allowance of five percent (5%) of materials and direct labor to cover the Contractor's profit, superintendence, administration, insurance and other overhead. The cost of transportation of materials shall be excluded when computing the above described charges for profit and overhead.

In computing the value of a change order which involves additions and deductions of work not covered by unit prices in the Form of Bid, where the added work exceeds the omitted work, overhead and profit shall be computed on the amount by which the cost of the additional work exceeds the cost of the omitted work.

In computing the value of a change order which involves deductions and additions of work not covered by unit prices in the Form of Bid, where the omitted work exceeds the added work, the Contractor shall credit ten percent (10%) for overhead and profit on the amount of work deducted.

In computing the value of a change order wholly or partially involving the work covered by unit prices listed in the Form of Bid, the value of that portion of the work covered by the unit prices shall be determined for both additions and/or deductions of work using the Bid unit prices, with no additional allowance made or credit taken for overhead and profit.

Overhead may be defined to include the following items:

- a) Premium on bond;
- b) Premium on insurance required by the State other than Workmen's Compensation Insurance, public liability and property damage insurance, unemployment insurance, Federal old-age benefits, other payroll taxes and such reasonable charges that are paid by the Contractor pursuant to written agreement with his employee;
- c) All salary and expenses of executive officers, supervising officers or supervising employees;
- d) All clerical or stenographic employees;

- e) All charges for minor equipment, such as small tools, including shovels, picks, axes, saws, bars, sledges, lanterns, jacks, cables, pails, wrenches, air tools, pumps, etc. and other miscellaneous supplies and services;
- f) All drafting room accessories such as paper, tracing cloth, blueprinting, etc.

Payment for force account work will be made on the basis of the following reports:

1. The Contractor will deliver to the Engineer a daily summary of force account work done on the Contract. This summary on 8-1/2" x 11" paper will be delivered to the Engineer not later than closing time on the day following that for which the work is reported.
2. The summary shall contain:
 - a) A list for materials used indicating the amount and nature of each material. The cost (if known) should also be included. This must be later documented by proper receipts.
 - b) A list of equipment used indicating the number of hours used and the kind, type and size of equipment.
 - c) A list of personnel by name, including the hours and rate at which they were used on the force account work.
 - d) A statement of the work accomplished by force account for that day.
 - e) This summary will be dated and signed by the Contractor's authorized representative and the Engineer.
 - f) The Contract number and other identification as well as the name of the Contractor shall appear on the statement.
 - g) The Engineer will make any notations, remarks or comments on this form that may assist in final payments.

Contractor's Cost Records

The Contractor shall maintain records of all payrolls and of the details that comprise his total cost pursuant to any of the provisions under the headings, Extra Work and Deductions, and he shall at any time within three (3) years following the date of acceptance of the project, make such records available, upon request therefor, to the Owner for review and audit, if deemed necessary by the Engineer or the Owner. In case all or part of such records are not made so available, the Contractor understands and agrees that any items not supported by reason of such unavailability of the records shall be disallowed, or if payment therefor has already been made, the Contractor shall, upon demand in writing by the Engineer or the Owner, refund to the Owner the amount so disclosed.

The Contractor agrees to prosecute such extra work with all reasonable diligence, and to employ thereon competent men. The Contractor shall give the Engineer or the Owner access to all accounts, bills, payrolls and vouchers relating to extra work not covered by unit prices unless a statement in writing of the actual cost of the same, fully itemized as to labor, materials and equipment is presented to the Engineer before the thirtieth (30th) day of the month following that during which each specific order was complied with by him.

Fb. 05 CLAIMS FOR UNAUTHORIZED EXTRA WORK

If the Contractor performs work which he considers is not included under any of the items of the Contract and which has not been specifically ordered in writing by the Engineer as extra work, he shall make claim for extra payment for such work by immediate oral notice followed by written notice within seven (7) calendar days after the occurrence, to the Engineer, and shall submit detailed cost data to support his claim within thirty (30) calendar days after the said work is performed. Should such work extend over a period of more than thirty (30) days, he shall submit monthly records of all cost data relating to the claim for extra payment of such work. The Engineer will either approve or deny the claim for extra work and shall provide a reason for his decision in writing within thirty (30) calendar days of the Contractor's claim.

Fb. 06 COMMENCEMENT AND COMPLETION

Bidders shall be prepared to commence work within seven (7) days of being given written notice by the Engineer to proceed and to continue in an expeditious manner and to complete substantially all the work in accordance with the Contract requirements. All of the work in this Contract shall be completed within one hundred (100) calendar days.

Fb. 07 AWARD OF CONTRACT

Acceptance of a Bid will be evidenced by Notice of Award of Contract, by the Owner in writing, delivered in person or by registered mail to the Bidder whose Bid is accepted. No other act of the Owner shall constitute acceptance of a Bid. The award of a Contract shall obligate the Bidder whose Bid is accepted to furnish Bonds, evidence of insurance, evidence of good standing with the Workmen's Compensation Board and execute the Agreement set forth in the Contract Documents.

Fb. 08 EXECUTION OF CONTRACT

The Contract Agreement shall be executed in quadruplicate by the successful Bidder and returned, together with contract bonds, evidence of insurance and required letters within seven (7) calendar days after receiving written notice of the award of the Contract. After execution by the Owner, one copy shall be returned to the Contractor.

If the Bidder refuses or fails to execute the Contract Agreement within seven (7) calendar days after the award, it will be considered that the Bidder has abandoned all rights and interests in the award in which case the Bid Bond, or certified check, accompanying the Bid Proposal shall become the property of the Owner.

Fb. 09 INDEPENDENT CONTRACTOR

The Contractor shall be an independent contractor, maintaining control over his own employees and operations; and neither the Contractor nor anyone employed by the Contractor shall be deemed to be a servant, employee or agent of Velsicol. The Contractor shall be responsible for and shall withhold or pay, or both, as may be required by law, all Federal, State and local taxes and contributions with respect to, measured by, or based upon compensation paid to or earned by the Contractor's employees.

Fb. 10 VARIANCES FOR UNAUTHORIZED EXTRA WORK

Should any field measured pay item quantity vary by more than plus or minus fifteen percent (15%) from the estimated quantity detailed on the bid sheet, and should the pay item be a Major Item as defined herein, the Contractor shall, solely at the Engineer's option, renegotiate with the Engineer the unit price bid for the item.

A Major Item is defined as any Contract bid item which has a total bid value or a total as constructed value of 5 percent (5%) or greater of the Contract total base bid value. The Contract total base bid value shall be the sum indicated in Clause Fb. 01.

Fb. 11 ADDENDA

We acknowledge receipt of Addenda numbered _____ to _____ inclusive, and the Contract Price includes the provisions set out in the issued Addenda.

BID SUMMARY SHEET

SUCUREMENT OF PLANT SITE

PHASE I

ST. LOUIS, MICHIGAN

SECTION A	PROJECT STARTUP	\$ _____
SECTION B	CONSTRUCT STORM SEWER	\$ _____
SECTION C	UPGRADIENT CONTAINMENT WALL	\$ _____
SECTION D	INTERNAL GROUNDWATER COLLECTED SYSTEM (PHASE I)	\$ _____
SECTION E	FINAL COVER (PHASE I)	\$ _____
SECTION F	HEALTH AND SAFETY PLAN	\$ _____
SECTION G	MISCELLANEOUS	\$ _____
SECTION H	PROJECT CLOSEOUT	\$ _____

	TOTAL BASE BID	\$ _____

The undersigned proposes to perform the Work, furnish all materials, and complete the Work in its entirety in the manner and under the conditions required at the prices listed above.

Name of Bidder: _____

Signature of Authorized Officer: _____

Title: _____

Witness: _____

Date: _____

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
A.	<u>PROJECT STARTUP</u>				
A-1	Mobilization	1	L. S.		
A-2	Medical Surveillance	20	Person		
A-3	Bonds & Insurance	1	L. S.		
					<hr/>
					TOTAL SECTION A
					\$
					<hr/> <hr/>

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
B. <u>STORM SEWER</u>					
B-1	MH10 to MCB9 18"Ø Conc. Pipe (CL. IV) Avg. depth = 3.5' to invert	185'	L. F.		
B-2	MCB9 to MHS 18"Ø Conc. Pipe (CL. IV) Avg. depth = 4.0' to invert	253'	L. F.		
B-3	Existing CB to MHS 12"Ø Conc. Pipe	1	L. S.		
B-4	MHS to MCB7 18"Ø Conc. Pipe (CL. IV) Avg. depth = 7.0' to invert	187'	L. F.		
B-5	MCB7 to MCB6 21"Ø Conc. Pipe (CL. IV) Avg. depth = 8.5' to invert	284'	L. F.		
B-6	MCB6 to MCB5 21"Ø Conc. Pipe (CL. IV) Avg. depth = 8.5' to invert	270'	L. F.		
B-7	MCB5 to MCB4 21"Ø Conc. Pipe (CL. IV) Avg. depth = 10.0' to invert	185'	L. F.		
B-8	MCB4 to MCB3 21"Ø Conc. Pipe (CL. IV) Avg. depth = 13.0' to invert	172'	L. F.		
B-9	MCB3 to MCB2 21"Ø Conc. Pipe (CL. IV) Avg. depth = 13.0' to invert	200'	L. F.		
B-10	MCB2 to MCB1 21"Ø Conc. Pipe (CL. IV) Avg. depth = 11.0' to invert	200'	L. F.		
B-11	MCB1 to Headwall 21"Ø Conc. Pipe (CL. IV) Avg. depth = 5.0' to invert	150'	L. F.		

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
B.	<u>STORM SEWER</u> (Cont'd)				
B-12	Ditch Interceptors 12"Ø CMP (8' ea.)	3	Each		
B-13	Manhole 10	4	V. F.		
B-14	Manhole Catchbasin 9	4	V. F.		
B-15	Manhole 8	6	V. F.		
B-16	Manhole Catchbasin 7	8	V. F.		
B-17	Manhole Catchbasin 6	9	V. F.		
B-18	Manhole Catchbasin 5	9	V. F.		
B-19	Manhole Catchbasin 4	12	V. F.		
B-20	Manhole Catchbasin 3	14	V. F.		
B-21	Manhole Catchbasin 2	12	V. F.		
B-22	Manhole Catchbasin 1	10	V. F.		
B-23	Headwall	1	L. S.		
B-24	Supply and place rip rap at headwall	20	S. Y.		
B-25	Install, operate and maintain all labor, equipment and material required to dewater storm sewer installation including transport of collected water to on-site holding tank	1	L. S.		

TOTAL SECTION B

\$

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
C. <u>UPGRADIENT CONTAINMENT WALL</u>					
C-1	Excavate for clay working platform and dispose of spoils on plant site	3,100	C. Y.		
C-2	Construct clay working platform	3,700	C. Y.		
C-3	Excavate, transport and place clay control berm along boundary fence line	1,000	C. Y.		
C-4	Construct upgradient containment wall complete	39,000	S. F.		
C-5	Excavate, transport, and place borrow material for containment wall backfill mix	750	C. Y.		
C-6	Supply quality control testing of materials during containment wall construction	1	L. S.		
				TOTAL SECTION C	\$ _____
					=====

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
<u>D. INTERNAL GROUNDWATER COLLECTION SYSTEM (PHASE I)</u>					
D-1	Interceptor @ MHS12 4"Ø Perforated Clay Pipe Avg. depth = 3.2' to invert	455	L. F.		
D-2	Interceptor @ MHS14 4"Ø Perforated Clay Pipe Avg. depth = 3.0' to invert	370	L. F.		
D-3	Excavate and place granular sumps at upgradient ends of interceptors	2	Each		
D-4	Install, operate and maintain all labor, equipment and material required to dewater trench excavation including transport of collected water to on-site holding tank	1	L. S.		
TOTAL SECTION D					\$ _____
					=====

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
E.	<u>FINAL COVER (PHASE I)</u>				
E-1	Install prefabricated gas vent units	3	Each		
E-2	Excavate, transport, place and compact clay for clay cap	50,000	C. Y.		
E-3	Supply and place water for compaction	10	M. Gal.		
E-4	Proof roll site prior to installation of clay cap	1	L. S.		
				TOTAL SECTION E	\$

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
F.	<u>HEALTH AND SAFETY PLAN</u>				
F-1	Safety Officer	75	Work Days		
F-2	Custodian	75	Work Days		
F-3	Maintain personnel hygiene Facility	1	L. S.		
F-4	Supply, site and maintain				
	a) Lunch room and equipment storage area	1	L. S.		
	b) Emergency medical facility	1	L. S.		
F-5	Provide and maintain safety apparel and equipment	20	Person		
F-6	Security	100	Days		

				TOTAL SECTION F	\$ _____
					=====

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
G	<u>MISCELLANEOUS</u>				
G-1	Excavate upper one (1) foot of soil between containment wall and City owned roadways, including temporary easement, and dispose on Plant Site	5,000	C. Y.		
G-2	Backfill excavation with 6 inches of imported fill and 6 inches of imported topsoil	5,000	C. Y.		
G-3	Excavate and dispose on Plant Site, concrete and steel debris from subdrain trench installation	1	L. S.		
G-4	Excavate, transport, place and compact clean fill over disposed spoils	5,300	C. Y.		
G-5	Seed, fertilize, and mulch all disturbed areas outside of Plant Site property	4.0	Ac.		
G-6	Regrade Watson St. from Station 0+00 to Station 4+30 with imported granular material	710	Ton		
G-7	Regrade driveway entrances with imported granular material	50	Ton		
G-8	Regrade ditches as indicated on drawings	1	L. S.		
G-9	Supply and place calcium chloride as directed by the Engineer	40,000	Gal.		
G-10	Provide mechanical road sweeper as directed by Engineer	75	Hr.		

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
G.	<u>MISCELLANEOUS</u> (Cont'd)				
G-11	Construct and maintain sedimentation control structures along Pine River embankment	1	L. S.		
G-12	Clean, maintain and restore County and City of St. Louis roadways used as haulage roads	1	L. S.		
					<hr/>
				TOTAL SECTION G	\$ <hr/> <hr/>

FORM OF BID

Item	Description	Estimated Quantity	Unit	Unit Price	Total Price
H.	<u>PROJECT CLOSEOUT</u>				
H-1	Decontaminate Equipment	1	L.S.		
H-2	Cleanup and Demobilize	1	L.S.		
				TOTAL SECTION H	\$

I. ADDITIONAL UNIT PRICES

The Contractor also agrees to accept payment at the following Bid Unit Prices for work done and materials supplied if and when directed by the Engineer. The Bid Prices include material, plant, labor, repairs, fuel, maintenance, overhead, supervision and profit in accordance with specifications.

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	
1.	Superintendent	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
2.	Foreman, including pick up truck	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
3.	Operator	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
4.	Laborer	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
5.	Tradesman (Electricians, plumbers, carpenters, etc.)	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
6.	Teamster	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
7.	Office Engineer/Clerk	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
8.	Surveyor	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
9.	Float with tractor			
		1) 16 - 40 tons	Hour	_____
			Day	_____
			Week	_____
		Month	_____	

I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
	ii) 40 - 60 tons	Hour Day Week Month	_____ _____ _____ _____
10.	Backhoe crawler mounted, hydraulically operated		
	i) less than 2 c.y.	Hour Day Week Month	_____ _____ _____ _____
	ii) 2 c.y. to 2.5 c.y.	Hour Day Week Month	_____ _____ _____ _____
	iii) greater than 2.5 c.y.	Hour Day Week Month	_____ _____ _____ _____
11.	Front End Loader, Crawler mounted		
	i) less than 2 c.y.	Hour Day Week Month	_____ _____ _____ _____
	ii) 2 c.y. to 2.5 c.y.	Hour Day Week Month	_____ _____ _____ _____
	iii) greater than 2.5 c.y.	Hour Day Week Month	_____ _____ _____ _____
12.	Front End Loader - Wheel mounted		
	i) less than 2 c.y.	Hour Day Week Month	_____ _____ _____ _____
	ii) 2 c.y. to 2.5 c.y.	Hour Day Week Month	_____ _____ _____ _____

I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
	iii) greater than 2.5 c. y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
13.	Tractor bulldozer crawler		
	i) less than 80 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 80 - 160 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) 160 - 240 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iv) Greater than 240 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
14.	Dump trucks		
	i) Single rear axle	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) Tandem rear axle	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) Tri rear axle	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iv) Tractor-Trailer	Hour	_____
		Day	_____
		Week	_____
		Month	_____

I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
15.	Graders		
	i) Greater than 100 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 80 - 100 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) less than 80 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
16.	Vibratory sheepsfoot roller self propelled		
	i) 10 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) Greater than 10 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
17.	Vibratory sheepsfoot roller - Towed		
	i) 10 ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) Greater than 10 ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
18.	Static pneumatic tired roller self propelled		
	i) 10 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____

I. ADDITIONAL UNIT PRICES (continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
	ii) 10 ton to 25 ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) Greater than 25 ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
19.	Static pneumatic tired roller-towed		
	i) 10 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 10 Ton to 20 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) Greater than 20 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
20.	Crane-Crawler or Rubber Tired		
	i) 15 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 15 Ton to 25 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) 25 Ton to 50 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iv) Greater than 50 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____

I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>		
21.	Rubber tired tractor backhoe	i) 1/2 c.y. or less	Hour	_____	
			Day	_____	
			Week	_____	
			Month	_____	
	ii) 5/8 to 3/4 c.y.	Hour	_____		
		Day	_____		
		Week	_____		
		Month	_____		
	iii) Greater than 3/4 c.y.	Hour	_____		
		Day	_____		
		Week	_____		
		Month	_____		
22.	Attachments to backhoes	i) HoePac compactor or equal	Hour	_____	
			Day	_____	
			Week	_____	
			Month	_____	
	ii) HoeRam breaker or equal	Hour	_____		
		Day	_____		
		Week	_____		
		Month	_____		
	23.	Compressor (Including Hoses)	i) less than 125 CFM	Hour	_____
				Day	_____
				Week	_____
				Month	_____
ii) 126 CFM to 175 CFM		Hour	_____		
		Day	_____		
		Week	_____		
		Month	_____		
iii) 176 to 375 CFM		Hour	_____		
		Day	_____		
		Week	_____		
		Month	_____		
iv) Greater than 375 CFM	Hour	_____			
	Day	_____			
	Week	_____			
	Month	_____			

I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	
24.	Farm tractor (all sizes)	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
25.	Proof Roller (35 to 50 Ton static weight)	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
26.	Generator	1) 5 KVA or less	Hour	_____
			Day	_____
			Week	_____
			Month	_____
		ii) 5.5 KVA to 15 KVA	Hour	_____
			Day	_____
			Week	_____
			Month	_____
		iii) Greater than 15 KVA	Hour	_____
			Day	_____
			Week	_____
			Month	_____

The prices submitted in this Table of "Additional Unit Prices" (Section I of the Form of Bid) do not affect the Contractor's Bid price on the project. The prices will be reviewed by the Engineer, and the Owner and the Engineer reserve the right to delete any price of the "Additional Unit Prices" that in their opinion is unbalanced or excessive; in such case work done under the item deleted will be negotiated in accordance with Section Fb. 04.

AGREEMENT

VELSICOL CHEMICAL CORPORATION

CONTRACT NO:

THIS AGREEMENT, entered into this _____ day of _____, 19__,
by VELSICOL CHEMICAL CORPORATION, hereinafter referred to as the "Owner",
and _____,

a Corporation organized and existing under the laws of the
State of Michigan

a partnership, consisting of _____

an individual conducting business as _____

the location of whose principal office is _____

hereinafter called the "Contractor".

WITNESSETH: That the Owner and the Contractor, for the consideration
hereinafter named agree as follows:

ARTICLE 1 WORK TO BE DONE

The Contractor shall:

- a) furnish all the materials (except as provided in Article 3), appliances, tools and labor of every kind required, and construct and complete in the most substantial and workmanlike manner, the construction, improvement or reconstruction of the project generally identified and shown on the Plans entitled "Securement of Plant Site, Phase I, St. Louis, Michigan", in accordance with the Contract Documents and Specifications entitled "Securement of Plant Site, Phase I, St. Louis Michigan", which contain the information for bidders; form of proposal, agreement, and bonds; general specifications and conditions of contract; materials of construction; and payment items; and
- b) do everything required by the Contract (Contract Documents) as defined herein.

ARTICLE 2 DOCUMENTS FORMING THE CONTRACT

The Contractor (and Contract Documents) shall be deemed to include: the Contractor's proposal; the Agreement; the General and Special Conditions; the "Specifications" referred to above; the plans; any addenda to Specifications if the same are issued prior to the date of receipt of proposal; and all provisions required by law to be inserted in the Contract whether actually inserted or not.

The Contract Documents consist of the sections listed below and should conflict appear within or between the various sections, priority shall be given in order of appearance in the following list.

1. Agreement
2. Plans
 - (a) General
 - (b) Details
3. Special Conditions, Bidding Information, Form of Bid
4. Project Specifications
5. General Conditions

ARTICLE 3. MATERIAL FURNISHED BY OWNER

The Owner will furnish to the Contractor without cost, topsoil, common fill and clay soil at source, lying in its natural state and condition, in quantity sufficient to complete the scope of work, and of quality to meet the detailed specifications for each material; and the personnel hygiene facility, and three gas venting units FOB St. Louis, Michigan.

ARTICLE 4 EXAMINATION OF DOCUMENTS AND SITE

The Contractor agrees that before making his proposal he carefully examined the Contract Documents, together with the site of the

proposed work, as well as its surrounding territory, and is fully informed regarding all of the conditions affecting the work to be done and labor and materials to be furnished for the completion of this Contract, including the existence and structures of municipal and other public service corporations on, over or under the site, and that his information was secured by personal investigation and research and not from the estimates or records of Velsicol Chemical Corporation, and that he will make no claim against the Owner by reason of estimates, tests or representations of any officer or agent of the Owner. When used in the Contract Documents, the term site shall refer to the Owner's St. Louis, Michigan, Plant Site.

ARTICLE 5 DATE OF COMMENCEMENT

The Contractor further agrees that he will begin the work herein embraced within seven (7) days of the effective date hereof, unless the consent of the Owner, in writing, is given to begin at a later date.

ARTICLE 6 ALTERATIONS AND OMISSIONS

The said work shall be performed in accordance with the true intent and meaning of the Contract Documents without any further expense of any nature whatsoever to the Owner other than the consideration named in this Agreement.

The Owner reserves the right, at any time during the progress of the work, to alter the Plans or omit any portion of the work as it may deem reasonably necessary; making allowances for additions and deductions at the prices named in the proposal, for this work without constituting grounds for any claim by the Contractor for allowance for damages or for loss of anticipated profits, or for any variations between the approximate quantities and the quantities of the work as done.

ARTICLE 7 NO COLLUSION OR FRAUD

The Contractor hereby agrees that the only person or persons interested as principal or principals in the Bid or proposal submitted by the Contractor for this Contract are named therein, and that no person other than those mentioned therein has any interest in the above-mentioned proposal or in securing the award, and that this Contract has been secured without any connection with any person or persons other than those named, and that the proposal is in all respects fair and was prepared and the Contract was secured without collusion or fraud and that neither any officer nor employee of Velsicol Chemical Corporation has or shall have a financial interest in the performance of the Contract or in the supplies, work or business to which it relates, or in any portion of the profits thereof.

ARTICLE 8 PAYMENT OF ESTIMATES

As the work progresses in accordance with the Contract and in a manner that is satisfactory to the Owner, the Owner hereby agrees to make payment to the Contractor therefor, based upon the proposal attached hereto and made a part hereof, as follows: The Owner shall once in each month and on such days as it may fix, make an estimate of the quantity of work done and of material which has actually been put in place in accordance with the terms and conditions of the Contract, during the preceding month, and compute the value thereof and pay to the Contractor the moneys due within 30 days of certification of the progress certificate by the Engineer. No monthly estimate shall be rendered unless the value of the work done equals five (5) percent of the Contract amount or \$1,000.00, whichever is lesser. The Owner shall retain ten per cent (10%), until the date of substantial completion, of all payments due the Contractor under this Contract. The Owner may, at any time after 50 percent of the work has been completed, if he finds that satisfactory progress is being made, reduce the total amount retained from progress payments to an amount not less than 5 percent of the total contract amount.

No payment shall be made to the Contractor hereunder unless Contractor shall have delivered to Owner, good and sufficient Contractors' and Sub-Contractors' sworn statements listing the names of all parties furnishing labor or materials, and the amounts due, or to become due to each; and unless Contractor shall have delivered to Owner good and valid waivers of lien of every party supplying labor and materials in the amount of all prior payments to such party.

All such sworn statements and waivers of lien shall comply with the Mechanics Lien laws of the State of Michigan and shall be in a form satisfactory to the Owner and Engineer.

ARTICLE 9 NO ESTIMATE ON CONTRACTOR'S NON-COMPLIANCE

It is further agreed that so long as any lawful or proper direction concerning the work or material given by Velsicol Chemical Corporation, or its representative, shall remain uncomplied with, the Contractor shall not be entitled to have any estimate made for the purpose of payment, nor shall any estimate be rendered on account of work done or material furnished until such lawful or proper direction aforesaid has been fully and satisfactorily complied with.

ARTICLE 10 SUBSTANTIAL COMPLETION

When the work or major portions thereof as contemplated by the terms of the Contract are, in the opinion of the Engineer, substantially complete, the Contractor shall submit to the Owner a requisition for payment of the remaining amount of the Contract balance. The Owner agrees to pay to the Contractor the remaining Contract balance less two times the estimated value of work items remaining to be completed, and an amount necessary to satisfy any claims, or judgements against the Contractor which have not been suitably discharged.

The Engineer shall be the sole judge as to the scope and value of uncompleted work items.

The amount of retention held by the Owner following substantial completion will not be less than five (5) per cent of the Contract value.

ARTICLE 11 PRELIMINARY ACCEPTANCE OF WORK

When in the opinion of the Engineer representing Velsicol Chemical Corporation the Contractor has fully performed the work under the Contract, the Engineer shall recommend to Velsicol Chemical Corporation the preliminary acceptance of the work so completed. If Velsicol Chemical Corporation accepts the recommendation of the Engineer, it shall thereupon by letter notify the Contractor of such preliminary acceptance, and copies of such acceptance shall be sent to other interested parties.

After preliminary acceptance of the work, the Engineer shall prepare an Agreement of work done from actual measurements and computations relating to the same, and he shall compute the value of such work under and according to the terms of the Contract. This Agreement shall be certified as to its correctness by the Engineer and submitted to Velsicol Chemical Corporation for approval. The right, however, is hereby reserved to Velsicol Chemical Corporation to reject the whole or any portion of the Agreement, should the said Certificate of the Engineer be found or known to be inconsistent with the terms of the Agreement or otherwise improperly given. All Certificates upon which partial payments may have been made being merely estimates, shall be subject to correction in the Final Certificate or Final Agreement.

Following acceptance by Velsicol Chemical Corporation of the Agreement of work done, prepared by the Engineer, the Owner will pay to the Contractor the full value of the Contract less two (2) per cent of the Contract value, the two (2) per cent being retained by the Owner until Final Acceptance.

ARTICLE 12 FINAL ACCEPTANCE AND PAYMENT

Prior to Final Acceptance of the Project and expiration of the Guarantee Period, the Engineer and Contractor shall perform a joint Final Inspection of the completed works. The Engineer will then prepare a schedule of deficient or inadequate work. The Contractor will promptly repair or replace all deficient work so listed to the satisfaction of the Engineer. Following completion of repairs, the Engineer will prepare a Final Certificate which shall:

- a) detail the final value of the Contract
- b) certify that all work performed is in accordance with the Terms and Conditions of the Contract

This Certificate shall be submitted to Velsicol Chemical Corporation for approval. The right, however, is hereby reserved to Velsicol Chemical Corporation to reject the whole or any portion of the Final Certificate, should the said certificate of the Engineer be found or known to be inconsistent with the terms of the Agreement or otherwise improperly given. All Certificates upon which partial payments may have been made being merely estimates, shall be subject to correction in the Final Certificate.

Final payment will be made by the Owner to the Contractor within sixty (60) days of the Owners approval of the Final Certificate.

ARTICLE 13 TAXES

The Contractor's prices set forth hereof does include sales, use, excise or similar taxes. Contractor agrees to provide proof of payment of sales tax at the time of invoice for all items covered by the invoice. Said proof is a condition precedent to Velsicol's obligation to pay.

ARTICLE 14 RIGHT TO SUSPEND WORK AND CANCEL CONTRACT

It is further agreed that if at any time during the prosecution of the work Velsicol Chemical Corporation shall determine that the work upon the Contract is not being performed according to the Contract or for the best interest of the Owner, the execution of the work by the Contractor may be temporarily suspended by Velsicol Chemical Corporation, who may then proceed with the work under its own direction in such manner as will accord with the Contract Specifications and be for the best interests of the Owner; or he may terminate the Contractor's employment under the Contract while it is in progress, and thereupon proceed with the work, in affirmance of the Contract, by Contract negotiated or publicly let, by the use of his own forces, by calling upon the surety to complete the work in accordance with the Plans and Specifications or by a combination of any such methods; or he may cancel the Contract and either readvertise and relet, or complete the work under his own direction in such manner as will accord with the Contract Specifications and be for the interests of the Owner; any excess in the cost of completing the Contract beyond the price for which it was originally awarded shall be charged to and paid by the Contractor failing to perform the work or his surety.

Whenever the Owner or the Engineer determines to suspend or stop work under the Contract, a written notice sent by mail to the Contractor at his address and to the sureties at their respective addresses, shall be sufficient notice of its action in the premises.

ARTICLE 15 DETERMINATION AS TO VARIANCES

In case of any ambiguity in the Plans, Specifications or maps, or between any of them, the matter must be immediately submitted to the Engineer, who shall adjust the same, and his decision in relation thereto shall be final and conclusive upon the parties.

ARTICLE 16 REMOVAL OF REJECTED WORK AND MATERIAL

The Contractor agrees that all work or material which may be rejected by the Owner or its representative shall be at once removed from the site of the work by the Contractor at his own expense, and replaced by work or material satisfactory to the Owner.

ARTICLE 17 SUCCESSORS AND ASSIGNS

This agreement shall bind the successors, assigns, and representatives of the parties hereto.

ARTICLE 18 PATENTS

- a) With regard only to equipment independently designed or manufactured by the Contractor, the Contractor shall defend and hold the Owner harmless from all costs, damages and expenses of litigation arising from infringement or claim of infringement of existing U.S. patents relating to such equipment or the use thereof by the Owner.
- b) With regard to equipment purchased by the Contractor for installation in the project, the Contractor shall secure from manufacturers, vendors and Subcontractors for such equipment the following hold harmless clause:

Seller shall defend and hold Buyer and Buyer's customer harmless from liability of every nature, including costs and expenses, for or on account of Seller's manufacture, sale or use of any patented or unpatented invention, article or appliance in the course of Seller's performance hereunder, the use and sale thereof by Buyer and the use thereof by use of any patented or unpatented invention, article or appliance in the course of Seller's performance hereunder, the use and sale thereof by Buyer and the use thereof by Buyer's customer; provided, however, that the foregoing provisions shall not extend to infringement to the extent that such infringement results from compliance with designs or drawings originating with Buyer or Buyer's customer.

- c) Should the Owner authorize the Contractor to purchase or design equipment in accordance with specifications provided by Owner, the Owner shall defend and hold the Contractor harmless from all costs, expenses and damages arising from infringement or claim of

infringement of existing U. S. patents with respect to such equipment brought against the Contractor.

- d) The Owner shall defend and hold the Contractor harmless from all costs, expenses and damages arising from infringement or claim of infringement of any existing U. S. patents by any process to be embodied in the project based upon information supplied by the Owner.
- e) The obligations with respect to defense and hold harmless as contained in this Article shall be conditioned upon the party to be defended or held harmless giving prompt notification of any claim of infringement and on the cooperation of such party in the defense of any infringement claim brought against the other.

ARTICLE 19 HOLD HARMLESS

- a) Contractor agrees to indemnify and hold harmless Owner, its agents officers and employees against all claims, suits, judgements and costs for injury or destruction of property or persons including death (including without limitation amounts paid pursuant to investigations or settlements and as counsel fees) in consequence of any claim by a third party against Owner, including without limitation any claim by an employee of Owner, Contractor or its Subcontractor and any claim by employees of another contractor or its subcontractor whether filed before or after payment, based on actual or alleged damage to or destruction of property or injury to persons caused by Contractor or any of his Subcontractors or by their respective employees in connection with the work.
- b) Contractor agrees to hold harmless and indemnify Owner for all claims, suits, judgements, settlements or costs for personal injuries to Contractor's employees or its Subcontractors' employees while on Owner's premises unless caused by Owner's sole negligence.
- c) Contractor agrees to hold harmless and indemnify Owner for all claims, suits, judgments, settlements or costs resulting from Contractors breach of any covenant, term or condition contained in this Agreement, including the General and Special Conditions attached hereto.

ARTICLE 20 WAIVER

The failure of either party to insist in one or more instances upon the terms of the Contract, or to exercise any right hereunder, shall not be construed as a waiver of the future performance of any such term or the future exercise of such right, and the obligation of each party with respect to such future performances shall continue in full force and effect.

ARTICLE 21 LIENS

The Contractor shall, without cost to the Owner, obtain by bonding or otherwise, the prompt discharge of any lien or liens which may be filed in connection with the work hereunder. Neither the final payment nor any part of the retained percentage shall become due until the Contractor shall have delivered to the Owner a complete release of all liens arising or which may arise out of this Contract or receipts in full in lieu thereof, and, in either case, an affidavit of the chief financial officer of the Contractor stating that the releases and receipts include all the labor and material for which a lien could be filed; but the Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may pay in discharging a lien, including all costs and reasonable attorneys' fees.

ARTICLE 22 INDEPENDENT CONTRACTOR

The Contractor, in accordance with its status as an independent Contractor, covenants and agrees that it will conduct itself consistent with such status, that it will neither hold itself out as, nor claim to be an officer or employee of Velsicol Chemical Corporation by reason hereof, and that it will not, by reason hereof, make any claim, demand or application to or for any right or privilege applicable to an officer or employee of Velsicol Chemical Corporation, including but not limited to Workmen's Compensation coverage, Unemployment Insurance Benefits, Social Security coverage or Retirement membership or credit.

IN WITNESS WHEREOF:

The parties hereto executed this Agreement the day and year first written.

VELSICOL CHEMICAL CORPORATION

CONTRACTOR

BY _____

BY _____

TITLE

TITLE

WITNESS _____

WITNESS _____

PERFORMANCE BOND

1. KNOW ALL MEN BY THESE PRESENTS, that we (hereinafter called the "Principal")

_____ of _____
_____ of _____
_____ of _____
_____ of _____
and _____ of _____

(hereinafter called the "Surety") are held and firmly bound unto Velsicol Chemical Corporation in the full and just sum of _____ Dollars (\$ _____) good and lawful money of the United States of America, to the payment of which said sum of money, well and truly to be made and done, the said Principal binds himself, his heirs, executors, administrators or assignees and the said SURETY binds itself, its successors or assigns, joints and severally, firmly by these presents.

2. SIGNED, SEALED AND DATED this _____ day of _____, 19____,

3. WHEREAS, said Principal has entered into a certain written Contract bearing date on the _____ day of _____, 19____, with Velsicol Chemical Corporation for the Securement of Plant Site, Phase I, St. Louis, Michigan.

Now, therefore, THE CONDITION OF THIS OBLIGATION IS SUCH that if the said Principal shall well, truly and faithfully perform the work in accordance with the terms of the Contract, and with the Plans and Specifications, and will commence and complete the work within the time prescribed in the Contract, on part to be kept and performed according to the terms and tenor of said Contract, and shall protect the said Velsicol Chemical Corporation against, and pay any excess of cost as provided in said Contract, and all amounts, damages, costs, and judgments which may be recovered against said State or its officers or agents or which Velsicol Chemical Corporation may be called upon to pay to any person or corporation by reason of any damages, direct or indirect, arising or growing out of the doing of said work, or from the negligence, nonfeasance, misfeasance or malfeasance of any office, agent or employee of Velsicol Chemical Corporation thereof, or suffered or claimed on account of said construction of the project during the time thereof and until the final completion and acceptance of the work, or the manner of doing same, or the neglect of the said Principal, or

his agents, or servants, or the improper performance of the said work by the said Principal, or his agents, or servants, or from any other cause, then this obligation shall be null and void, otherwise to remain in full force and virtue.

The Surety hereto agrees that in case the said Contract is forfeited by the Principal hereto in the manner provided in the Contract and the Principal fails to deposit to the credit of Velsicol Chemical Corporation the excess cost of completing the work occasioned by the failure of the Contractor, then and in that case the Surety will within ten (10) days from the date of notice by Velsicol Chemical Corporation of the amount of such excess cost deposit to the credit of said Department such sum of money as the said Department certifies to the Surety as being the excess above the funds remaining available for this Contract, free from all liens and incumbrances in the hands of Velsicol Chemical Corporation.

And the said SURETY hereby stipulates and agrees that no changes, extension, alteration, deduction or addition in or to the terms of the said Contract or the Plans or Specifications accompanying the same, shall in any way affect the obligations of said SURETY of his bond.

CORPORATE SEAL OF PRINCIPAL
if a CORPORATION

CORPORATE SEAL OF SURETY

_____ L. S.

_____ L. S.

_____ L. S.

_____ L. S.

_____ L. S.

(Acknowledgment by Principal, if a corporation)

VELSICOL CHEMICAL CORPORATION)
) ss.:
COUNTY OF _____)

On this _____ day of _____, 19____, before me personally came _____ to me known, who being duly sworn, did depose and say that he resides in _____ that he is the _____ of the _____ the corporation described in and which executed the foregoing instrument; that he knew the seal of said corporation; that the seal affixed to said instrument was such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

(Seal)

Notary Public

(Acknowledgment by Surety Company)

VELSICOL CHEMICAL CORPORATION)
) ss.:
COUNTY OF _____)

On this _____ day of _____, 19____, before me personally came _____ to me known, who being duly sworn, did depose and say that he resides in _____ that he is the _____ of the _____ the corporation described in and which executed the foregoing instrument; that he knew the seal of said corporation; that the seal affixed to said instrument was such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

(Seal)

Notary Public

(The Surety Company must append statement of its financial condition and a copy of the resolution authorizing the execution of Bonds by officers of the Company)

IN TESTIMONY WHEREOF, the said PRINCIPAL has hereunto set his (their, its) hand and seal and the said Surety has caused this instrument to be signed by its _____ President and its _____ Secretary, and its corporate seal to be hereunto affixed, the day and year first above written.

SIGNED, SEALED AND DELIVERED
in the presence of

(Corporate seal of
Principal if a
Corporation

_____ (L.S.)

Principal

Company

Of _____

By _____
(Title of Officer)

Attest _____
(Title of Officer)

Surety

(Corporate Seal
of Surety Co.)

(Acknowledgment by Principal, unless it be a corporation)

VELSICOL CHEMICAL CORPORATION)
) ss. :
COUNTY OF _____)

On this _____ day of _____, 19____, before me personally came _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he executed the same.

Notary Public County

(Acknowledgment by Principal, if a corporation)

VELSICOL CHEMICAL CORPORATION)
) ss. :
COUNTY OF _____)

On this _____ day of _____, 19____, before me personally
came _____ to me known, who being duly sworn,
did depose and say that he resides in _____
that he is the _____ of the _____
the corporation described in and which executed the foregoing instrument; that he
knew the seal of said corporation; that the seal affixed to said instrument was
such corporate seal; that it was so affixed by order of the Board of Directors of
said corporation, and that he signed his name thereto by like order.

Notary Public

(Acknowledgment by Surety Company)

VELSICOL CHEMICAL CORPORATION)
) ss. :
COUNTY OF _____)

On this _____ day of _____, 19____, before me personally
came _____ to me known, who being duly sworn,
did depose and say that he resides in _____
that he is the _____ of the _____
the corporation described in and which executed the foregoing instrument; that he
knew the seal of said corporation; that the seal affixed to said instrument was
such corporate seal; that it was so affixed by order of the Board of Directors of
said corporation, and that he signed his name thereto by like order.

Notary Public

VELSICOL CHEMICAL CORPORATION

I hereby approve the foregoing Contract and bond as to form and manner of execution.

DATED _____

Corporate Counsel

VELSICOL CHEMICAL CORPORATION

I hereby approve the foregoing Contract and bond.

DATED _____

Vice President
Health and Regulatory Affairs

LIST OF SUB-CONTRACTORS

The following is a list of Sub-contractors or Sub-trades together with a description of the items showing the portion of the work to be undertaken by each.

	NAME	ADDRESS	ITEM DESCRIPTION
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____

The employment of Sub-contractors or Sub-trades other than those listed above will not be permitted without written approval from the Engineer. Information indicating how the Sub-contractors or Sub-trades listed above qualify in experience and background required of the Contractor in accordance with this Document shall be requested by the Engineer before award of the Contract.

DATED THIS _____ DAY OF _____, 19__

Signature of Witness

Signature of Authorized Person
signing for Contractor

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
_____, as Principal, and _____
_____, as Surety, are hereby held and
firmly bound unto Velsicol Chemical Corporation as Owner
in the penal sum of _____
for the payment of which, well and truly to be made, we hereby jointly and
severally bind ourselves, our heirs, executors, administrators, successors and
assigns.

Signed, this _____ day of _____, 19__.

The condition of the above obligation is such that whereas the Principal has
submitted to Velsicol Chemical Corporation a certain Bid,
attached hereto and hereby made a part hereof to enter into a contract in
writing, for the Securement of Plant Site, Phase I, St. Louis, Michigan

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or in the alternate,
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid.

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

Surety

By _____

(S E A L)

GENERAL CONDITIONS

Gc. 01 DEFINITIONS

i) Contract

"Contract" means the Contract to do the work, the Bonds or Securities, the Addenda (if any), the Specifications, the General and Special Conditions, the Bidding Information, the List of Contract Documents, the Drawings, and all other documents referred to or connected with the agreement.

ii) Owner

"Owner" means Velsicol Chemical Corporation.

iii) Contractor

"Contractor" means the person or corporation to whom the Contract for the work has been awarded.

iv) Subcontractor

"Subcontractor" means the person or corporation having a contract with the Contractor (or with another subcontractor) for the execution of a part or parts of the work included in the Contract, or for the supplying of material for the Contract and worked to a special design according to the Plans and Specifications.

v) Engineer

"Engineer" means Conestoga-Rovers & Associates Limited and their duly authorized agents.

vi) Work

"Work" means all labor, materials and other things required to be done, that are shown, described or implied in the Contract Documents, and includes all extra and additional work and material that may be ordered by the Engineer.

vii) Contract Price

"Contract price", wherever and in whatever manner used, means either the total lump sum Bid of the Contractor or the total of the unit price Bids of the Contractor extended, based upon the estimated quantities set forth in the proposal, or combinations thereof, plus or minus any adjustments made in accordance with the Contract.

viii) Day

"Day" means a calendar day of 24 hours.

ix) Person

"Person" includes firms, companies and corporations.

x) Contract Drawings

"Contract Drawings" or "Drawings" means and includes (a) all Drawings which have been prepared on behalf of the Owner and which are included as part of the Contract Documents and all modifying Drawings issued by addenda thereto; (b) all Drawings submitted pursuant to the terms of the Contract by the Contractor with his proposal and by the Contractor to the Owner during the progress of work when accepted by the Engineer; and (c) all Drawings submitted by the Engineer to the Contractor during the progress of the work.

xi) Contractor's Plant and Equipment

"Contractor's plant and equipment" means everything, except labor, brought onto the site by the Contractor in order to carry out the work, but not to be incorporated in the work.

xii) Shown

"Shown", "indicated", "detailed", and words of like import, wherever and in whatever manner used, with or without reference to the Drawings, means shown, indicated or detailed on the Drawings.

xiii) Sufficient

"Sufficient", "necessary", or "proper", "acceptable", "satisfactory", "desirable", and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means sufficient, necessary, proper, acceptable, satisfactory and desirable in the judgment of the Engineer.

xiv) Directed

"Directed", "designated", "permitted", "required", "accepted", and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means as directed, designated, permitted, required, and accepted by the Engineer.

xv) Specified

"Specified", "described", or "noted", wherever and in whatever manner used, means as specified, described or noted in the Contract Documents.

xvi) Submitted

"Submitted", wherever and in whatever manner used, means submitted to the Engineer for his acceptance.

xvii) Provide

"Provide", wherever and in whatever manner used, shall be understood to mean provide complete in place; that is, furnish and install.

xviii) Shall or Will

"Shall" or "will", whenever used to stipulate anything, means shall or will be done or be performed by either the Contractor or Velsicol Chemical Corporation and means that the Contractor or Velsicol Chemical Corporation has thereby entered into a covenant with the other party to do or perform the same.

xix) May

"May", wherever and in whatever manner used, is permissive.

xx) Herein

"Herein", "hereinafter" and words of similar import shall refer to the Contract Documents.

xxi) Supply

"Supply", wherever and in whatever manner used means Contractor supplies, F.O.B. the site.

xxii) Progress Payment (also known as Estimate for Payment)

"Progress Payment" and "Estimate for Payment" and like terms shall be one and the same and refer to the method of monthly payments to the Contractor in accordance with the terms of the Contract.

xxiii) Safety Officer

The Contractor's employee responsible for the implementation and enforcement of the Project Health and Safety Plan. The Safety Officer shall have a minimum of two years working experience in the chemical industry or chemical waste disposal industry or shall be a registered industrial hygienist with two years related experience. The Safety Officer shall have a sound working knowledge of state and federal occupational safety and health regulations and formal educational training in occupational safety and health.

xxiv) Custodian

The Contractor's employee responsible for keeping all safety equipment and project facilities clean, properly equipped, and maintained.

Gc. 02 DOCUMENTS

- a) The Contract Documents shall be signed and sealed, in quadruplicate, by the Owner and the Contractor.
- b) The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intention of the documents is to include all plant, labor and materials (except as specifically excepted) necessary for the complete and proper execution of the work.
- c) Reference to published standard specifications shall be to the edition current at the time of the signing of the Contract Documents.
- d) Plans and Specifications shall be read and interpreted together. Work and materials not specifically described, but obviously necessary for the satisfactory completion of the work for the purpose intended shall be supplied and performed by the Contractor as though it has been described and shown in the Plans and Specifications.

Gc. 03 SUB-CONTRACTORS

- a) Without the written approval of the Engineer, the Contractor shall not add to, delete from, or change the subcontractors named in the Contract.
- b) The Contractor shall be held as fully responsible to the Owner for the acts and omissions of his sub-contractors (and of persons directly and indirectly employed by them) as for the acts and omissions of persons directly employed by the Contractor.
- c) Nothing in the Contract Documents shall create any contractual relation between any sub-contractor and the Owner.
- d) The Contractor shall bind every sub-contractor to the terms of the Contract Documents, as far as applicable to the sub-contractor's work.
- e) Any division of the Specifications into sections or sub-sections shall be only for clarity of reading and reference, and shall not be taken to be a division into trades, sub-trades or sections of work of any kind.

Gc. 04 NOTICE

- a) Any notice of communication to the Contractor shall be deemed to be legally well and sufficiently given and served if:
 - (i) posted or sent to the address given in the Bid, or

- (ii) posted or sent to the place where the work is, or is to be carried on, or
 - (iii) posted or sent to the address given in the Agreement, or
 - (iv) posted or sent to the Contractor's domicile or usual place of business, or
 - (v) posted to or left at his last known address, or
 - (vi) handed to the Contractor or any of his clerks or agents.
- b) In any notice to the Contractor with respect to work and repairs of any nature required to be done under the Contract (or with respect to any other matter), it shall not be obligatory for the Engineer to specify minutely and in detail everything required, nor to specify by measurement the exact extent or place where the work and repairs are to be carried out. Reference may be made in such a notice to the clauses in the Contract bearing upon the matter, the general location, and the general description of the work and repair to be done.

Gc. 05 INFORMATION TO BE FURNISHED BY CONTRACTOR

The Contractor shall furnish all drawings, specifications, descriptive data, certificates, samples, tests, methods, schedules, and manufacturer's instructions as specifically required in the Contract Documents, and all other information as may reasonably be required to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the Specifications and Drawings. If the information shows any deviation from the Contract requirements, the Contractor shall, by a statement in writing accompanying the information, advise the Engineer of the deviation and state the reason therefor.

Gc. 06 COMMENCEMENT AND COMPLETION

- a) The Contractor shall obtain materials and start work when the Contract Documents have been signed by the Owner and the Contractor, and when the Engineer has issued a written instruction to commence.
- b) No progress certificate (also called 'estimate for payment') shall release the Contractor from any responsibility under the Contract, nor be taken as evidence of acceptance of work or material, nor as a waiver of any provisions of the Contract.
- c) The Contractor shall protect the work from damage from every cause, and shall, on completion, leave the work in a good and satisfactory condition. The work shall be finished in all respects and shall comply with the Contract in every particular.

- d) On completion, all surplus material and rubbish shall be removed, all damage to adjacent property caused by the Contractor shall be made good, and the site shall be made clean and neat.

Gc. 07 USE OF PREMISES

- a) The Contractor shall confine his plant, labor and materials within limits specified in the Contract or as otherwise indicated by law or as directed by the Engineer. The Contractor shall not unreasonably encumber the site with plant and materials.
- b) The Contractor shall not load, or permit to be loaded, any structure with a weight that may endanger its safety.
- c) The Contractor shall comply with the Engineer's directions regarding signs, advertisements, fires and smoking.
- d) The Contractor shall use the premises only for the completion of the work forming the Contract.

Gc. 08 UTILITIES

Unless otherwise specified, the Contractor shall provide all utility services, such as water, electricity, heat and gas, needed for the execution of the work.

Gc. 09 PUBLIC SAFETY

- a) During the progress of the work, the Contractor shall keep the site and the work in as tidy a condition as practicable. The Contractor shall not deposit any material on any portion of a street, sidewalk, boulevard, or other public property without the approval of the Engineer. Material so deposited shall be removed without delay as soon as possible and when directed.
- b) When work is carried out at night, the Contractor shall provide, erect and operate a sufficient number of lights to enable the work to be performed satisfactorily.
- c) If the work is closed, suspended or stopped for the winter (or for any other approved reason), the Contractor shall remove all material from streets, sidewalks, boulevards and other public property.
- d) The Contractor shall provide, erect and maintain all necessary barriers, fences and other proper protection, and shall provide and maintain watchmen and lights as may be necessary to ensure the safety of the public and others. Unless otherwise specified, the Contractor shall keep all streets and sidewalks open for use by the public, for such width as the Engineer may direct. The Contractor shall provide, erect and maintain a sufficient number of detour signs, and other proper notices, wherever the use of any street or sidewalk is dangerous due to the Contractor's operations.

- e) Only authorized employees of Contractors or Subcontractors shall have access to the Plant Site. In no circumstance shall Contractors' or Subcontractors' employees enter upon any portion of the Plant Site for which entry has not been authorized.

Gc. 10 STATUTES

- a) In all matters affecting the performance of the work, the Contractor shall comply with all relevant statutes, by-laws, and ordinances of Federal and State Governments and of Municipal Corporations. The Contractor shall also comply with all relevant regulations made under such statutes, by-laws and ordinances.
- b) Unless otherwise specified, the Contractor shall pay all fees, procure all licenses and certificates, deposit all Drawings and give all notices required by any of the foregoing statutes, by-laws, ordinances and regulations.

Gc. 11 PROSECUTION OF THE WORK

- a) The Contractor shall complete all the work in accordance with a schedule set down in co-operation with the Engineer at the time of the award of the Contract. Amendments to this schedule may be made by the Engineer, on application by the Contractor.
- b) Should the Contractor leave the site of the work (either permanently or temporarily), he shall provide and leave a competent and reliable agent or superintendent in charge. Such person shall act in place of the Contractor.
- c) Should the Engineer be of the opinion that the quantity or quality of labor or plant supplied by the Contractor is not sufficient, or that the methods being employed are not such as will ensure that the work will be completed within the specified time, the Contractor shall forthwith improve the quality and increase the number of men employed, shall make revisions to the plant, and shall employ work methods satisfactory to the Engineer.

Gc. 12 RESTORATION

- a) Unless otherwise specified, the Contractor shall restore all lands and other property to their original condition.
- b) The Contractor shall maintain the flow of water in ditches, culverts and watercourses. At the conclusion of construction, ditches, culverts and watercourses shall be restored in a neat and workmanlike manner to a condition at least equal to the original.

Gc. 13 OPERATIONAL RISKS

The position of pole lines, conduits, watermains, sewers, and other underground and overground utilities and structures is not necessarily shown on the Contract Drawings, and, where shown, the accuracy of the position of such utilities and structures is not guaranteed. Before starting work, the Contractor shall inform himself of the exact location of all such utilities and structures, and shall assume all liability for damage to them. Unless otherwise specified, the Contractor shall support all such utilities and structures, or temporarily remove them, and restore them, to the satisfaction of the owners of the utilities and structures.

Gc. 14 WORKMANSHIP

- a) All workmanship and material shall be first-class in every particular and shall be to the approval of the Engineer. The Contractor shall pay due regard to the neat appearance of the finished work.
- b) If ordered by the Engineer, the Contractor shall make such openings in the work as are needed to re-examine the work, and shall forthwith make the work good again. Should the Engineer find the work so opened up to be faulty in any respect, the whole of the expense of opening, inspecting and making good shall be borne by the Contractor. Should the Engineer find the work opened up to be in perfect condition, such expense will be borne by the Owner.

Gc. 15 OWNERSHIP OF PLANT AND MATERIAL

- a) The Contractor's plant, and all approved material to be incorporated into the work, shall, at the option of the Owner, become and continue to be under the control of the Owner from the time of arrival on the site until completion of the work.
- b) The Contractor shall not remove any such plant or approved material from the site without the Engineer's approval. No payment of money will be made by the Owner with respect to such plant.

Gc. 16 REJECTION OF WORK AND MATERIALS

The Engineer may at any time condemn and reject material and work, which, in his opinion, are not in accordance with the Contract Documents or the Engineer's instructions, and the Engineer will require the substitution of proper materials. All rejected materials shall be promptly removed from the site.

Gc. 17 MATERIAL

Unless otherwise specified, the Contractor shall supply all material, and shall furnish for approval representative samples of all material. Substitution of material of equivalent quality shall be made only on the written approval of the Engineer.

a) General Quality

All materials, equipment and accessories shall be new and unused and shall be essentially the standard product of a manufacturer regularly engaged in the production of such material or equipment. The Contractor, when specifically requested in the detailed specifications for a particular material, equipment or accessory item, shall offer satisfactory operation for five (5) or more years, except that in the instance of recently developed items having a short service record, they may be considered if the equipment supplier or manufacturer supplies a bond or cash deposit which will guarantee replacement in the event of failure within a five (5) year period from the date of acceptance of the items. Such items proposed under these conditions must meet all the technical requirements as stated in the specifications.

b) Quality in Absence of Detailed Specifications

Whenever, under the Contract Documents, it is provided that the Contractor shall furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market from firms of established good reputation, or if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required with due consideration of the use to which they are to be put. In general, the work performed shall be in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.

c) Material and Equipment Specified by Name

Whenever any material or equipment is specified by patent or proprietary name or by the name of the manufacturer, such specification shall be considered as used for the purpose of describing the material or equipment desired and shall be considered as if followed by the words "or acceptable equal", whether or not such words appear. The Contractor may offer material or equipment with equal or better qualities and performance in substitution for those specified which he considers would be in the Owner's interest to accept. No offers for substitution will be acknowledged or considered from suppliers, distributors, manufacturers or sub-contractors. Any such offer shall be made in writing to the Engineer for his consideration at least 2 weeks in advance of the time at which the Contractor wishes to order the material or equipment for use in the work, and the Contractor shall include with

his offer sufficient data which, together with any other data the Engineer may require, will enable the Engineer to assess the acceptability of the material or equipment. When the substitute equipment or material necessitates changes to or coordination with any other portion of the work, the data submitted shall include drawings and details showing all such changes, and the Contractor shall perform these changes as part of any acceptance of his offer by the Engineer. Such acceptance by the Engineer shall not relieve the Contractor from full responsibility for the efficiency, sufficiency, and quality and performance of the substitute material or equipment, in the same manner and degree as the material and equipment specified by name.

Gc. 18 THE ENGINEER

- a) The Engineer will make such decisions as are necessary with respect to:
- i) Discrepancies in the Contract Documents, or
 - ii) Differences of opinion or misunderstanding that may arise as to the meaning of the Contract, or
 - iii) Omissions or misstatements in the Contract Documents, or
 - iv) Quality, dimensions and sufficiency of plant, materials, or work, or
 - v) The due and proper execution of the work, or
 - vi) The measurement, quantity or valuation of the work, including additional work and deductions, or
 - vii) Any other questions or matters arising out of the Contract.

The Engineer's decision as to any matter referred to in this clause shall be binding upon the parties concerned.

- b) The Engineer may at all reasonable times visit, enter and make inspections at any building, factory, workshop, site of work whenever materials are being prepared, made or treated, or where work is being done in connection with the Contract. The Engineer may also take such samples as he may consider necessary.
- c) When the Engineer makes a decision under this clause, the Contractor shall immediately proceed with all work affected by the decision. Additions to or deductions from the Contract price shall be made only provided for in the Contract, and no revisions to the completion time shall be made, unless approved by the Engineer.

Gc. 19 COLD WEATHER

At no time shall the slurry for construction of the upgradient containment wall, be mixed when ambient temperatures are below 35 degrees F. Should the Contractor anticipate temperatures dropping below 35 degrees F., he must take precautionary measures to cover and protect the slurry in the trench and in the containment areas from freezing.

Gc.20 OWNERSHIP OF DOCUMENTS

All Contract Documents, including all Drawings, Specifications, models and similar items supplied by the Engineer are his property. Such Documents are not to be used on other work and, with the exception of the signed Contract Documents, shall be returned by the Contractor to the Engineer on the completion of the work. This section refers to all copies or reproductions as well as original material.

Gc.21 DETAILS AND INSTRUCTIONS

- a) The Contractor shall not deviate from or in any way alter the Contract Documents without the written authority of the Engineer. Any ambiguities, omissions or discrepancies that may arise will be explained and adjusted by the Engineer, who may issue to the Contractor instructions directing the manner of performing the work.
- b) If necessary for the proper execution of the work, the Engineer may issue additional instructions, as drawings or otherwise, and all such instructions shall become parts of the Contract. The work shall be executed in conformity with such instructions, and the Contractor shall do no additional work without such instructions.
- c) The Contractor shall perform and observe the provisions of the Contract and carry out the written directions of the Engineer. Should the Contractor refuse or neglect to carry out the written instructions of the Engineer within seven (7) days, the Engineer may
 - i) take such steps (including the procuring of plant, labor and material) and do such work as he may consider advisable, or
 - ii) at the option of the Owner, exercise the powers specified in Gc.34.

The cost so incurred may be deducted or collected under the provisions of the Contract, and any such action taken by the Engineer shall not relieve the Contractor from any liability under the Contract.

Gc.22 LIABILITY

The Contractor shall assume the defence of and shall indemnify and save harmless the Owner from all claims unless specified otherwise:

- a) resulting from the prosecution of the work, or
- b) resulting from any of the Contractor's operations, or
- c) caused by reason of any material, plant or labor used in the work, or
- d) arising from any act of commission or omission on the part of the Contractor, or

- e) relating to inventions, copyrights, trademarks, patents (and rights to them) used in doing the work, or in the use and operation of work on completion, unless otherwise specified.

Gc. 23 LIABILITY INSURANCE

The Contractor shall, at his expense, insure and maintain insurance against liability for bodily injury and property damage that may arise with respect to the work being performed under the Contract. Such insurance shall:

- a) be in the joint names of the Owner, the Contractor, the Sub-contractors, the Engineer and the Municipality.
- b) have inclusive limits of liability as set forth in the Special Conditions, Clause SC. 13.
- c) include coverage for:
 - i) Contractual liability, and
 - ii) Cross liability, and
 - iii) Contingent Employer's liability, and
 - iv) Completed Operations liability, and
 - v) Property in care, custody, and control of Contractor
 - vi) Explosion, collapse or underground fault
- d) remain in force for 60 days following the issue by the Engineer of the Final Payment Certificate.

Gc. 24 VEHICLE INSURANCE

The Contractor shall, at his expense, insure and maintain insurance against liability for bodily injury and property damage caused by vehicles owned by the Contractor and used on the work. The Contractor shall also, at his expense, insure and maintain insurance against liability for bodily injury and property damage caused by vehicles not owned by the Contractor and used on the work. Such insurance shall each have an inclusive limit at least equal to \$3,000,000.00.

Gc. 25 INSURANCE POLICIES AND CERTIFICATES

- a) When the successful Bidder is notified that his Bid has been accepted he shall deposit with the Owner.
 - i) either copies of liability and vehicle insurances, or insurance certificates indicating compliance with Clauses Gc. 23 and Gc. 24.
- b) Insurance policies shall stay in force and not be amended, cancelled or allowed to lapse without thirty (30) days' prior notice.

c) The Contractor shall deposit certificates with the Owner indicating that the Contractor has paid assessments under the Workmen's Compensation Act as provided in Clause Gc-26. Such certificates shall be deposited:

- i) at the time of award of the Contract, and
- ii) at intervals of six months during the course of the Contract, and
- iii) prior to the issue of the Final Certificate.

Gc. 26 WORKMEN'S COMPENSATION

The Contractor and his sub-contractors shall maintain Workmen's Compensation Insurance in the amount and type required by law for all employees employed under this Contract who may come within the protection of Workmen's Compensation Laws. In jurisdictions not providing complete Workmen's Compensation protection, the Contractor and his sub-contractors shall maintain employer's general liability insurance in an amount, form, company and agency satisfactory to the State for the benefit of all employees not protected by Workmen's Compensation Laws.

The Contractor shall pay such assessments as will protect him and the Owner from claims under the Workmen's Compensation Laws.

Gc. 27 LOSS OR DAMAGE

The Owner shall not be answerable or accountable for loss or damage by fire or otherwise of the work, or part of the work, or for any material, equipment, or similar items to be incorporated into the work.

The Contractor shall properly guard the works and make good all loss or damage of whatever nature or origin that may arise out of the Contract, until the work is complete as indicated by the issue by The Engineer of the Acceptance Certificate.

Gc. 28 HOURS OF WORK

The Engineer may prohibit the Contractor from carrying on operations during any hour or hours of the day in which the Engineer, in his judgment, deems such operations to be a disturbance or nuisance to the public or be detrimental to the interest of the Owner.

Such prohibition may be made notwithstanding any prior consent, order, agreement or requirement in the Contract that stipulates maximum or minimum hours of work.

Gc. 29 PAYMENTS TO THE CONTRACTOR AND SUB-CONTRACTORS

Payment to the Contractor and Sub-contractors shall be made as follows:

1. Payment by Owner to Contractor

The Contractor shall periodically, in accordance with the terms of the Contract, submit to the Owner and/or his agent a requisition for a progress payment for the work performed and/or materials furnished to the date of the requisition less any amount previously paid to the Contractor. The Owner shall in accordance with the terms of the Contract approve and promptly pay the requisition for the progress payment less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged and less any retained amount as hereafter described. The Owner shall retain not more than ten (10) percentum of each progress payment to the Contractor. The Owner shall pay, upon requisition from the Contractor, for materials pertinent to the project which have been delivered to the site or off-site by the Contractor and/or Subcontractor and suitably stored and secured as required by the Owner and the Contractor provided, the Owner may limit such payment to materials in short and/or critical supply and materials specially fabricated for the project each as defined in the Contract. When the work or major portions thereof as contemplated by the terms of the Contract are substantially completed, the Contractor shall submit to the Owner and/or his agent a requisition for payment of the remaining amount of the Contract balance. Upon receipt of such requisition the Owner shall approve and promptly pay the remaining amount of the Contract balance less two (2) times the value of any remaining items to be completed and an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. As the remaining items of work are satisfactorily completed or corrected, the Owner shall promptly pay, upon receipt of a requisition, for these items less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. Any claims, liens and judgments referred to in this section shall pertain to the project and shall be filed in accordance with the terms of the applicable Contract and/or applicable law.

2. Payment by Contractor to Subcontractors

Within fifteen (15) calendar days of the receipt of any payment from the Owner, the Contractor shall pay each of his subcontractors and material men the proceeds from the payment representing the value of the work performed and/or materials furnished by the subcontractor and/or materialman as reflected in the payment from the Owner less any amount necessary to satisfy any claims, liens or judgments against the subcontractor or materialman which have not been suitably discharged and less any retained amount as hereafter described. The Contractor shall retain not more than ten (10) percentum of each payment to the subcontractor and/or materialman. However, the Contractor shall retain nothing from those payments representing proceeds owed the subcontractor and/or materialman from

the Owner's payments to the Contractor for the remaining amounts of the Contract balance as provided in subdivision of this section. Within fifteen (15) calendar days of the receipt of payment from the Contractor, the subcontractor and/or materialman shall pay each of his subcontractors and materialmen in the same manner as the Contractor has paid the subcontractor. Nothing provided herein shall create any obligation on the part of the Owner to pay or to see to the payment of any moneys to any subcontractor or materialman from any Contractor nor shall anything provided herein serve to create any relationship in contract or otherwise, implied or expressed, between the subcontractor or materialman and the Owner.

Gc. 30 PROGRESS CERTIFICATE

The Contractor shall be entitled to receive partial payments upon the certificate of the Engineer of the value of work done and materials supplied.

For Progress Certificates, the Engineer's decision as to the estimated value of completed work and materials supplied shall be final, but shall not be binding on him, the Contractor or the Owner in the estimating of the final value of the work, nor shall it be taken as evidence as to the ownership of, or payment for the work.

Gc. 31 FINAL ACCEPTANCE CERTIFICATE

- a) When the work required to be done under the Contract has been completed in every respect and is acceptable to the Engineer, a final valuation of the Contract will be prepared by the Contractor and the Engineer.
- b) The Contractor shall submit to the Engineer a statement indicating the Contractor's valuation of the work according to records available to the Contractor. The Engineer will review this statement and either approve it or submit detailed reasons for revisions that, in his opinion, should be made.
- c) Should the Engineer consider it advisable, the Engineer will prepare a final valuation of the work and submit it to the Contractor who shall either approve it or submit detailed reasons for revisions that, in his opinion, should be made.
- d) When the Engineer and Contractor have reached agreement as to the final value of the work, the Engineer will issue an Acceptance Certificate, detailing the valuation of the Contract, and certifying its acceptance at a certain specific date, referred to as the "acceptance date".

- e) Should the Engineer and Contractor be unable to reach agreement as to the final value of the work within a reasonable period, the Engineer will issue his Acceptance Certificate detailing his valuation of the Contract and certifying acceptance of the work at a certain specific date, referred to as the "acceptance date".

Gc. 32 FINAL PAYMENT CERTIFICATE AND RELEASE OF HOLDBACKS

Provided all the provisions of the Contract have been fully met, the Engineer will issue a Final Payment Certificate upon final acceptance. The Final Payment Certificate will entitle the Contractor to receive the full amount due under the Contract. Holdbacks held under the provisions of Clause Gc. 29 shall be released as recommended in the Final Payment Certificate only after the Contractor has provided a properly completed Statutory Declaration indicating that no moneys, claims, liens, or judgments against the Contractor relative to this Contract has been received by the Engineer.

Gc. 33 VALUATION

- a) At monthly intervals, the Contractor and the Engineer shall make a valuation of the work constructed and material supplied under the Contract. Should the Engineer wish to measure any of the work or material, the Contractor shall assist in such measurements and furnish all particulars required.
- b) The monthly valuations described in subsection (a) above shall not bind the Owner, the Contractor or the Engineer to any final valuation of the work to be done under the Contract, but shall be construed as approximations only for the purpose of Progress Certificates.
- c) The final valuation of the work shall be prepared as soon as possible after the whole of the works has been completed.

Gc. 34 TERMINATION OF CONTRACT

- a) In addition to Owner's cancellation rights as set forth in Article 14 of the Agreement, the Owner may terminate the employment of the Contractor, if the Engineer certifies that sufficient cause exists to justify such action. Such termination of employment may be made:
 - (i) if the Contractor should be adjudged a bankrupt, or
 - (ii) if he should make a general assignment for the benefit of his creditors, or
 - (iii) if a receiver should be appointed on account of his insolvency, or

- (iv) if he should take the benefit of any Act relating to insolvent debtors, or
 - (v) if a winding up order be made against the Contractor, or
 - (vi) if he should refuse or fail to supply enough plant, properly skilled labor or proper materials after having received seven (7) days' notice in writing from the Engineer to do so, or
 - (vii) if he should fail to make prompt payment to subcontractors and suppliers, or
 - (viii) if he should persistently disregard laws, ordinances or the instructions of the Engineer, or
 - (ix) if he should otherwise be guilty of a substantial violation of the provisions of the Contract.
- b) Should the Owner terminate the employment of the Contractor, as provided in subsection (a) above, he shall give the Contractor seven (7) days' written notice of such termination of employment.
- c) Should the Owner terminate the employment of the Contractor, as provided in subsection (a) above, he may take possession of the premises and of all materials and plant on the premises, and may finish the work by any method he may deem expedient, but without undue delay or expense. In such case, the Contractor shall not receive any further payment until the work is completed.
- d) If the unpaid balance of the Contract price exceeds the expense of finishing the work (including compensation to the Engineer for his additional services), such excess shall be paid to the Contractor. If such expense exceeds the unpaid balance, the Contractor shall pay the difference to the Owner. The additional expense incurred by the Owner due to the Contractor's default shall be certified by the Engineer.
- e) If the work should be stopped by order of any court or public authority, for a period of 90 days or more through no act or fault of the Contractor, anyone employed by him, or any of his subcontractors, the Contractor, after ten (10) days written notice to the Owner, may terminate the Contract. Forthwith upon the termination of the Contract, the Engineer shall estimate all of the work done up to the time of such termination and the Contractor shall be entitled to and shall receive payment therefor in the manner provided in the Contract. In addition thereto, the Owner will pay to the Contractor in full and complete satisfaction and settlement for the Contractor's inconvenience, loss of anticipated profits, cost of removing his equipment from the site and all other expenses whatsoever, ten (10) percent of the difference between the Engineer's estimate of the Contract price and the sum of the payments made to the Contractor for work done up to the date of the termination of Contract. The Contractor shall be entitled to no further payment whatsoever for the work.

For the purpose of this article, "all of the work done" includes all materials ordered by the Contractor prior to the date of receipt of such notice of termination, whether or not they have been delivered to the site of the work. The amount of payment for all such materials under this article shall be their actual necessary cost to the

Contractor up to the date of receipt of such notice of termination. Upon the receipt of such notice of termination, all the Contractor's right, title and interest in and to the materials mentioned in this article shall be vested in the Owner, and the Contractor shall upon demand of the Owner execute and deliver to the Owner all requisite bills of sale, assignments and other documents of transfer that may be necessary to give effect to the intention of this article.

Gc. 35 STANDARD SPECIFICATIONS

Whenever a standard specification, code or recommended practice is referred to, it shall be the latest edition of that specification code or recommended practice and it shall be considered to be a part of the Contract Documents insofar as it applies. Standard specifications, codes, recommended practices and abbreviations used in the Contract Documents are listed in Section Sc. 14 of the Project Specifications.

Gc. 36 ASSIGNMENT

The Contractor shall not assign the Contract, or any part of it without the written consent of the Owner, nor shall the Contractor assign any moneys due, or to become due, to him without consent of the Owner.

SPECIAL CONDITIONS OF THE CONTRACT

Sc. 01 GENERAL

It is the intent of these Special Conditions to describe the miscellaneous work to be done and the materials to be used in the construction of services and all related work under this Contract and to amplify the Standard Specifications.

The Special Conditions are to be read in conjunction with and take precedence over the Standard Specifications and General Conditions.

Sc. 02 CONTRACTOR'S SCHEDULE FOR CONSTRUCTION

The Contractor shall submit to the Engineer a complete detailed construction schedule indicating the various elements of the construction procedure, equipment deliveries and installations and an indication of all areas of critical happenings which are for some reason flexible and which may alter the path and timing of the proposed schedule. The construction schedule shall be submitted to the Engineer for approval not more than one (1) week after the notification to the Contractor to commence work.

Sc. 03 PERMANENT RECORD

The Contractor shall keep a permanent record on the site showing dates of commencement and completion of all trades and other work, daily weather conditions, excavations, backfilling, formwork, concrete work, and removal of forms. He shall keep in duplicate, daily records of the number of men engaged on the job and on each division of the work and make these available to the Engineer upon request.

Sc. 04 INCLEMENT WEATHER

The Contractor shall provide adequate protection and take caution at times of inclement weather. Inclement weather or extra work caused by such weather will not be accepted as reason for any additional payment.

Sc. 05 INSURANCE CLAIMS

Claims or alleged claims received by the Contractor shall be dealt with immediately by the Contractor and a copy sent to the Engineer. If a claim is settled to the satisfaction of the claimant, the Contractor shall submit a copy to the Engineer of the claimants release.

If a claim or alleged claim is rejected by the Contractor and/or his insurance company, the Contractor shall immediately report this fact to the Engineer.

Should thirty (30) days elapse after the claim or alleged claim has been received by the Contractor, and the Contractor is not able to report a settlement or rejection of the claim, he shall report to the Engineer the steps being taken with respect to the claim.

Sc. 06 PERFORMANCE AND PAYMENT BONDS

The successful Bidder must deliver to the Owner an executed Performance Bond in an amount at least equal to one hundred percent (100%) of the accepted Bid as security for the faithful performance of the Contract, and also must deliver to the Owner a separate executed Payment Bond in an amount at least equal to one hundred percent (100%) of the accepted Bid as security for the payment of all persons performing labor and furnishing materials in connection with this Contract. The sureties of all bonds shall be such surety company or companies as are approved by the Owner, and as are authorized to transact business in the State of Michigan. The bonds must be approved by the Owner prior to execution of the formal Contract, and shall remain in effect for ninety (90) days beyond the date of the Final Acceptance of the project.

Sc. 07 MAINTENANCE AND REPAIR BOND

The successful Bidder must deliver to the Gratiot County Road Commission an executed Maintenance and Repair Bond in an amount at least equal to \$50,000 as security for the maintenance and repair of all County Roadways used as haul roads during performance of the Contract. The sureties of this bond shall be such surety company or companies as are approved by the Owner, and as are authorized to conduct business in the State of Michigan. The bonds must be approved by the Owner prior to execution of the formal Contract and must remain in effect until final release is obtained by the Contractor from the Gratiot County Road Commission, following completion of the Contract.

Sc. 08 UTILITIES

The Contractor shall protect and support if necessary all utilities to maintain their operation. Any utilities which are damaged by the Contractor shall be immediately replaced, at the Contractor's expense.

Sc. 09 FAILURE TO COMPLETE WORK ON TIME AND LIQUIDATED DAMAGES

For each calendar day that any work shall remain uncompleted after the Contract date specified for the completion of the work provided for in the Contract, the amount of \$1,000.00 per calendar day will be deducted from any money due the Contractor, not as a penalty but as liquidated damages; provided however, that due account shall be taken of any adjustment of the Contract time for completion of the work as provided for elsewhere in the Specifications.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion or after the date to which

the time for completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the Contract.

The Owner may waive such portions of the liquidated damages as may accrue if he deems the work is in such condition as to be safe and convenient for use.

The assessing of liquidated damages shall be in addition to Engineering Charges as provided for in Sc. 11 of the Specifications.

Sc. 10 EXTENSION OF TIME

Delays which affect the scheduled completion date of the project and attributable to interference between contractors and utility owners, delays by railroad companies in progressing related work, special requirements or actions by municipalities, federal agencies and other public bodies not anticipated in the Contract Documents, and unusually severe storms of extended duration or impact shall be compensated solely by the granting of an extension of time by the Velsicol Chemical Corporation to complete the work of the Contract without engineering charges. Time necessary for reviews by the Owner or Engineer of shop drawings, for field changes to meet actual conditions, and delays incurred by seasonal and weather limitations should be anticipated and are neither compensatory nor eligible for extensions of time.

Where extra costs can be demonstrated relative to delays caused directly by acts of the Owner beyond the Contract requirements, such costs as are necessary may be reimbursable subject to the prompt substantiation of such costs by the Contractor via the initiation of procedures specified in Fb. 04 and Fb. 05. The substantiated necessary costs of such delays which may be considered for reimbursement shall be limited to orders by the Owner to stop work for reasons other than provided in the Contract Specifications and requirements and for the unavailability of right-of-way parcels for such an extended period beyond that indicated in the Contract Documents that the Contractor's progress on the Contract as a whole is significantly affected.

The Contractor agrees that he has included in his unit price Bid for the various items of the Contract the additional costs of doing the work under this Contract caused by not having a clear site for the work, by interference by other contractors and necessary utility work and by the other non-compensatory delays described above.

Sc. 11 ENGINEERING CHARGES

When the work embraced in the Contract is not completed on or before the date specified therein, engineering and inspection expenses incurred by the Owner upon the work from the completion date originally fixed in the Contract to the final date of completion of the work may be charged to the Contractor and may be deducted by the Owner from any moneys due the Contractor. Consideration of any extra work or order on the Contract added to the original Contract, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the Owner before assessing engineering and inspection charges against the Contractor. Such charges will be assessed, however, in cases where the work has been unduly delayed by the Contractor because of unwarranted reasons, inefficient operation, or for any other reason for which the Owner determines the Contractor liable.

Sc. 12 SAFETY AND SECURITY

The Contractor shall perform all work in the Contract in a workmanlike manner with due regard to the safety of the employees and of the public.

The Contractor shall submit with his bid a detailed health and safety plan that shall address the aspects of carrying out the construction work specified, under potential exposure to hazardous chemical materials. Contractor agrees that the employees of Contractor and/or any subcontractor will be notified that in consideration of working on Velsicol's premises, each employee and his automobile shall be subject to search at any time while on, entering or leaving Velsicol's premises and each employee understands that promptly upon Velsicol's request, any employee may be requested to submit to a polygraph (lie detector) test regarding theft of property located on Velsicol's premises.

Sc. 13 INSURANCE

The Contractor shall procure and maintain at no additional expense to the Owner, until Final acceptance by the Owner of the work covered by the Contract, insurance for liability for damages imposed by law, of the kinds and in the amounts hereinafter provided by insurance companies authorized to do such business in the State and covering all operations under the Contract whether performed by him or by subcontractors. Before commencing the work the Contractor shall furnish to the Engineer a certificate or certificates of insurance in form satisfactory to the Engineer showing that he has complied with this paragraph, which certificate or certificates shall provide that the policies shall not be changed or cancelled until thirty (30) days written notice has been given to the Engineer. The types and limits of insurance are as follows:

A. Workmen's Compensation Insurance

A policy covering the obligations of the Contractor in accordance with the provisions of the Laws, as amended, known as the Workmen's Compensation Law, covering all operations under the Contract, whether performed by him or by his Subcontractor. The Contract shall be void and of no effect unless the person or corporation making or executing same shall secure compensation and disability benefits coverage for the benefit of and keep insured during the life of said Contract, such employees in compliance with the provisions of the Workmen's Compensation Law. Coverage under this section will not be less than \$100,000.00.

B. Liability and Property Damage Insurance

Unless otherwise specifically required by special specifications, each policy will have limits as shown hereafter:

<u>Employers Liability</u>	- \$200,000.00 each accident - Coverage B
<u>Contractor Comprehensive</u>	- General Liability (including Contractual, complete operations, and XCU coverage.)
Bodily Injury	- \$200,000.00 each person - \$500,000.00 each occurrence
Property Damage	- \$200,000.00 each occurrence (including operative, products, contractual)
<u>Automobile Liability</u>	
Bodily Injury	- \$100,000.00 each person - \$300,000.00 each occurrence
Property Damage	- \$100,000.00 each accident
<u>Umbrella Coverage</u>	- \$5,000,000.00 in excess of primary limits above

FOOTNOTE: The Contractor's attention is directed to the insurance limits required for the performance of work under this Contract and that these limits of coverage ARE NOT to be amended by deductible clauses of any nature without the expressed written consent of the Owner, or unless specifically provided for in these Specifications.

L. Contractor's Liability Insurance issued to and covering the liability for damages imposed by law upon the CONTRACTOR with respect to all work performed by him under the agreement;

2. Contractor's Liability Insurance issued to and covering the liability for damages imposed by law upon EACH SUBCONTRACTOR with respect to all work performed by said Subcontractor under the agreement;
3. Contractor's Protective Liability Insurance issued to and covering the liability for damages imposed by law upon the Contractor with respect to all work under the agreement performed for the Contractor by Subcontractors;
4. Protective Liability Insurance issued to and covering the liability for damages imposed by law upon Velsicol Chemical Corporation and the City of St. Louis and all employees and agents of the Velsicol Chemical Corporation and the City of St. Louis both officially and personally, with respect to all operations under the agreement by the Contractor or by his Subcontractors, including omissions and supervisory acts of the State;
5. Completed Operations' Liability Insurance issued to and covering the liability for damages imposed by law upon the Contractor and each Subcontractor arising out of that part of the work performed by each;
6. Owners', Landlords' and Tenants' Liability Insurance issued to and covering the liability for damages imposed by law upon Velsicol Chemical Corporation and the City of St. Louis and all employees and agents of the Velsicol Chemical Corporation and the City of St. Louis both officially and personally, with respect to temporarily opening to vehicular traffic any portion of the project under the agreement, until the construction pursuant to the agreement has received final acceptance by Velsicol Chemical Corporation.
7. Automotive Liability Insurance issued to and covering the liability for damages imposed by law upon the Contractor, his sub-contractor, Velsicol Chemical Corporation and the City of St. Louis, and all employees and agents of Velsicol Chemical Corporation and the City of St. Louis with respect to the operation and control of any and all vehicles owned, leased or otherwise employed by the Contractor or his sub-contractors during performance of work under the agreement.
8. All Risk Insurance to protect the Contractor from the hazard of damage to the work in progress. Such insurance shall be in the amount of the total Contract Bid or in the sum of One Million Dollars, (\$1,000,000.) whichever is the lesser, and shall contain a deductible feature not to exceed the sum of Five Hundred Dollars (\$500).

Sc. 14 STANDARD SPECIFICATIONS

The following standard specifications may be referred to herein, and should be read in conjunction with the General Conditions, Section Gc. 35.

Air Moving and Conditioning Association (AMC)
American Association of State Highway Officials (AASHO)
American Concrete Institute (ACI)
American Gas Association (AGA)
American Gear Manufacturer's Association (AGMA)
American Institute of Steel Construction (AISC)
American Iron and Steel Institute (AISI)
American National Standards Institute (ANSI)
American Petroleum Institute (API)
American Society for Testing and Materials (ASTM)
American Society of Civil Engineers (ASCE)
American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
American Society of Mechanical Engineers (ASME)
American Standard Safety Code for Elevators, Dumbwaiters and Escalators (ASE Code)
American Water Works Association (AWWA)
American Welding Society (AWS)
American Wood Preservers' Association (AWPA)
Anti-friction Bearing Manufacturers' Association (AFBMA)
Gratiot County Building Code
Gratiot County Electrical Code
Gratiot County Plumbing Code
Gratiot County Standard Plans and Specifications
Concrete Products Association of Washington (CPAW)
Diesel Engineer Manufacturers' Association (DEMA)
Edison Electric Institute (EEI)
Expansion Joint Manufacturers' Association (EJMA)
Federal Specifications (Fed. Spec.)
Illuminating Engineering Society (IES)
Institute of Electrical and Electronics Engineers, Inc. (IEEE)
Instrument Society of America (ISA)
Insulated Power Cable Engineers' Association (IPCEA)
Joint Industrial Council (JIC)
National Electric Safety Code (NESC)
National Electrical Code (NEC)
National Electrical Manufacturers' Association (NEMA)
National Fire Protection Association (NFPA)
National Lumber Manufacturers' Association (NLMA)
Occupational Safety and Health Act (OSHA)
Overhead Electrical Crane Institute (OECI)
Rental Rates for Construction Equipment (BLUE BOOK) by Associated Equipment Distributors
Tabular Exchanger Manufacturers' Association (TEMA)
Underwriters' Laboratories, Inc. (UL)
Uniform Building Code (UBC)
Applicable Environmental Standards

Sc. 15 CONFIDENTIALITY

The Contractor shall not, without the prior consent of Velsicol, in each instance, describe to any third person any of the details or characteristics of the work and Contractor, its employees and representatives will hold in confidence and not use or reveal to others any proprietary Velsicol technology or other data which may come into its or their possession or knowledge in connection with the work.

Sc. 16 LABOR RELATIONS

The Contractor shall use its best efforts to maintain satisfactory labor relations with organization representing labor hired directly by Contract and by any Subcontractor. Contractor will use its best efforts to promptly resolve disputes with the objective of reducing work stoppages to a minimum.

The Contractor shall immediately notify the Owner of the occurrence of any labor dispute, or of a threatened or actual stoppage, affecting employees of Contractor or of a Subcontractor.

Sc. 17 IMPORTED FILL

Velsicol shall provide to the Contractor, without cost, topsoil and earthen fill lying in its natural state, at a location approximately 2.3 miles distant from the site of work. The location of the topsoil and fill source is indicated on the Contact Drawings as well as the haul routes to be used between the topsoil and fill source and the site of work. The Contractor shall limit the travel of loaded trucks or heavy equipment to the roads indicated on the Plan.

The Contractor shall at all times maintain Gratiot County and City of St. Louis owned roadways to the satisfaction of the Engineer and Owners. Following completion of haulage operations, the Contractor shall make all repairs necessary to restore County and City roadways to a condition no worse than existed prior to commencement of haulage operations.

Sc. 18 ADJACENT LANDS

The Contractor shall limit his activities to within the boundaries of the Velsicol Plant Site. During the storm sewer construction, the Contractor shall limit his activities to the temporary easement as shown on the Contract drawings. Should any damage occur to lands not within the Plant Site boundary as a result of the Contractor's activities, the Contractor shall restore the damaged areas to the satisfaction of Velsicol, the City of St. Louis and private property owners.

Sc.19 PLANT SITE FENCE

The Contractor shall remove the existing chain link fence, along the Plant Site property line, adjacent to the construction activity on a daily basis. Temporary fencing shall be erected to prevent entrance of unauthorized persons onto the Plant Site. The existing chain link fence shall only be removed as far as the Contractor anticipates his daily progress to be.

At the completion of the Contract, the Contractor shall reinstall the chain link fence along the original lines and in a condition, equal to or better than its original.

Sc.20 GUARANTEE PERIOD

The guarantee period for the Contract shall be twelve (12) months, and shall commence at the date of Preliminary Acceptance.

For purposes of the upgradient wall the Contractor is requested to provide warranties regarding the quality of his workmanship and/or the long term performance of the completed containment wall. As a minimum, the Contractor shall provide a warranty on workmanship and materials for fifteen (15) years.

Sc.21 MATERIALS TESTING

As further detailed in the Project Specifications, a representative from Velsicol and from the Michigan Department of Natural Resources will be present to collect samples for testing throughout the containment wall construction. The Contractor shall provide access and assistance as required to expedite the collection of the soil samples.

Where required by the Engineer, the Contractor shall supply for testing, samples of all materials to be used in the construction, and shall not use any material until it has been approved. All testing will be done by a testing firm hired and approved by the Engineer, except as otherwise specified in the Contract Documents.

Sc.22 AMBIENT AIR MONITORING

Velsicol shall install and operate a total of six (6) ambient air monitors adjacent to the Plant Site. Total suspended particulate analysis shall be conducted on a daily basis. The data so obtained, shall be utilized by the Engineer to monitor and revise, if necessary, the Contractor's dust control program. On a biweekly basis, filters shall also be analyzed for selected chemical contaminants.

The Contractor shall conduct his operations in such a manner that the air quality standards listed below are not violated.

Indicator Compounds - 150 nanograms/filter
(HBB, DDT, PBB, TRIS)

Total Suspended Particulates - 150 micrograms/cubic meter

Should one or more air monitors indicate exceedence of the air quality standards, the Contractor shall immediately revise his methods of operations and/or dust control techniques. All costs associated with complying with the air quality standards shall be borne by the Contractor.

Access to the two air sampling units, labelled P2 and P4 on the Contract Drawings, presently located along the Velsicol fenceline, shall be maintained at all times during the Contractor's activities.

Sc. 23 ENTRY TO SITE

It is the responsibility of the Contractor to ensure that each and every employee, whether of the Contractor, or a subcontractor, or of an agent of the Contractor, be explicitly informed prior to entry to the site of work, that the site of work is over or adjacent to a location where hazardous waste has been disposed.

Sc. 24 WATERMAIN

The Contractor's attention is drawn to the existence of an 8 inch cast iron watermain along the north side of Washington Avenue (M-46), adjacent to the location of the proposed storm sewer.

It is the Contractor's responsibility to maintain this watermain at all times during construction of the storm sewer to the satisfaction of the Engineer and the City of St. Louis. All costs for maintenance of the watermain and adjacent structures shall be the Contractor's sole responsibility.

Sc. 25 SEGREGATION OF WORK AREAS

For the purpose of this contract, all areas within or enclosed by the Velsicol property fenceline, or the Contractor's temporary security fence, shall be considered contaminated. All personnel and equipment within these areas shall strictly conform to the provisions of the Project Health and Safety plan. It is especially stressed that personnel access to the site will be allowed only through the personal hygiene facility at the north east corner of the site.

Requests for relief from any provision of the Health and Safety plan shall be submitted in writing by the Contractor to the Engineer. Approval, if granted, will be issued only in written form by the Engineer.

PROJECT SPECIFICATIONS

Ps. 1 PROJECT SPECIFICATIONS - GENERAL

Ps. 1. 01 CONTRACTOR'S OFFICE

During the performance of the Contract, the Contractor shall provide and maintain a suitable office at the site of the work which shall be the headquarters of a representative of the Contractor.

Ps. 1. 02 CONTRACTOR'S REPRESENTATIVE

During the performance of the Contract, the Contractor shall have on site during working hours a designated Project Manager empowered to act on behalf of the Contractor in all matters pertaining to the Contract. The Contractor shall within seven (7) days of execution of the Contract, nominate such person or persons, in writing, to the Engineer. Such person or persons shall remain, in the context of this Contract, the Contractor's designated agent(s) until such time as notification to the contrary is received in writing by the Engineer.

Ps. 1. 03 CONSTRUCTION UTILITIES AND MISCELLANEOUS FACILITIES

1. Power

Unless otherwise specified, the Contractor shall provide at his own expense all necessary power and special connections to power lines.

2. Water

Unless otherwise specified, the Contractor shall provide at his own expense all necessary water and special connections to a potable water supply.

3. Telephone

The Contractor shall provide at his own expense, a telephone service and required secretarial extension, at each of the Contractor's and Engineer's office. A radio telephone service is not acceptable as a substitute for the required telephone service. Long distance phone calls made by the Engineer shall be paid for by the Owner upon receipt of the proper documentation.

4. Sanitary Facilities

The Owner shall supply a Personnel Hygiene facility equipped with toilet facilities for all site personnel.

The Contractor shall provide at his own expense adequate toilet facilities for all workmen and the Owner's representatives employed on the work, in addition to those provided within the

hygiene facility should they be required. The Contractor shall maintain at his own expense the same in sanitary condition from the beginning of the work until completion and shall then remove the facilities and disinfect the premises. All portions of the work shall be maintained at all times in a sanitary condition.

5. Parking Facilities

A vacant lot at the south east corner of Bankson Street and North Street will be made available by Velsicol to the Contractor for parking. All costs associated with levelling maintaining, and final cleanup of this area shall be the responsibility of the Contractor.

Should additional off-road parking be required the Contractor shall supply additional areas at his own expense.

6. Temporary Heating

The Contractor shall provide at his own expense temporary heating, covering and enclosures as necessary to protect all work and material against damage by dampness and cold and to facilitate completion of the work. The Contractor shall supply all the fuel, equipment and materials required for temporary heating.

Ps. 1. 04 SURVEYS

Unless otherwise specified, the Engineer will establish reference bench marks and base lines adjacent to the work. The Contractor shall develop and make such additional detail surveys as are needed for construction, such as slope stakes, batterboards, stakes for pile locations and other working points, lines and elevations. Bench marks, base lines, property boundaries, line and grade hubs, and other references and construction points, and such survey points shall thereafter be maintained. The Contractor shall notify the Engineer in writing at least five (5) working days in advance of the time he will commence work on any part of the construction.

The Engineer shall be responsible for measurement of all items for payment. The Engineer shall provide a certificate of such measurements to the Contractor.

The Contractor shall provide reasonable and necessary opportunities and facilities for setting points and making measurements during construction. He shall not proceed until he has made request to the Engineer for, and has received from him, such points as may be necessary as the work progresses. The construction shall be done in conformance with such points.

Ps. 1. 05 LANDS BY OWNER

The Owner will provide certain lands, in connection with the work under the Contract, together with the right of access to such lands. The Contractor shall not unreasonably encumber the premises with his plant or materials.

Ps. 1. 06 LANDS BY CONTRACTOR

The Contractor shall provide, with no liability to the Owner, any additional land and access thereto not shown or described that may be required for temporary construction facilities or storage of materials. He shall construct all access roads, detour roads, or other temporary work as required by his operations. All such areas must be approved by the Engineer prior to use by the Contractor.

Ps. 1. 07 EXISTING UTILITIES

In general the locations of some existing major utilities, whether aboveground or underground, are indicated on the drawings. This information has been obtained from utility maps and from verbal descriptions provided by the various agencies involved. The Engineer or the Owner do not guarantee the accuracy or completeness of this information and it is to be understood that other aboveground or underground facilities not shown on the drawings may be encountered during the course of the work. In any case, minor lines such as water, gas, and sewer services are not indicated.

Existing aboveground utilities, including but not limited to power transmission and distribution, telegraph, telephone and traffic control systems, whether shown on the drawings or not, shall, at the Contractor's expense, be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor in a manner satisfactory to owners and operators of the utilities and to the Owner.

Existing major underground utilities and appurtenant structures whether shown on the drawings or not, shall, at the Contractor's expense, be maintained, relocated, rerouted, removed and restored by the Contractor.

Minor underground utility service lines, including but not limited to sanitary sewer services, gas services, water services, house or yard drains, and electric or telephone services, shall be maintained, relocated, rerouted, removed and restored by the Contractor with the least possible interference with such services and in no case shall the interference of such service lines be considered for extra compensation under any of the special cases listed above.

The right is reserved by owners of public utilities and franchises to enter upon any street, road, right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or changes caused by the work. The costs thus incurred shall be paid by the Contractor.

Ps. 1.08 RESTORATION OF STRUCTURES AND SURFACES

1. Structures

The Contractor shall remove such existing structures as may be necessary for the performance of the work, and if such structures are not shown or specified for demolition, shall rebuild the structures thus removed in as good a condition as found with minimum requirements as herein specified. He shall also repair all existing structures which may be damaged as a result of the work under this contract.

2. Curbs, Gutters, Driveways and Sidewalks

All curbs, gutters, driveways, sidewalks and similar structures that are broken or damaged by the installation of the work, unless shown otherwise, shall be reconstructed by the Contractor. Reconstruction shall be of the same kind of material with the same finish, and in not less than the same dimensions as the original work. All concrete shall be as specified herein unless otherwise indicated. Repairs shall be made by removing and replacing the entire portions between joints or scores and not merely refinishing any damaged part. All work shall match the appearance of the existing improvements as nearly as possible.

3. Roads and Streets

All roads and streets in which the surface is removed, broken or damaged, or in which the ground has caved or settled due to work under this contract, unless shown otherwise, shall be completely resurfaced and brought to the original grade and crown sections unless otherwise indicated. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean, solid, vertical faces, and shall be free of any loose material. Paving shall be as indicated and specified. Roadways used by the Contractor for hauling materials, equipment, supplies, etc., shall be cleaned and repaired if the condition of the roadway is damaged or otherwise affected due to the Contractor's operations.

4. Cultivated Areas and Other Surface Improvements

All cultivated areas, either agricultural or lawns, and other surface improvements which are damaged by actions of the Contractor, unless otherwise shown, shall be restored as nearly as possible to their original condition. Altering of original conditions during restoration must be done only on written approval of the Engineer.

5. Existing Stakes and Marks

All section, section subdivision, plat, U. S. E. D, U. S. C. & G. S., U. S. G. S. and other official monuments or bench marks shall be carefully preserved or replaced. In the event any such monument or marker is disturbed as a result of the Contractor's operations, the Contractor shall replace or reset such monument or marker in a manner satisfactory to the Engineer. Replaced or reset monuments shall be of acceptable type and quality and shall be located so as to clear existing utilities or any other interferences. They shall be placed in a manner consistent with good and recognized engineering and surveying practice by a Michigan State licenced surveyor.

Ps. 1.09 FIELD TESTS AND ADJUSTMENTS

All work shall be tested by the Contractor to the satisfaction of the Engineer before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the work has been properly performed. Any changes, adjustments or replacements required to bring the work into conformance with the Specifications shall be carried out by the Contractor as part of the work.

Ps. 1.10 CLEANING UP

The Contractor shall not allow the site of the work to become littered with trash and waste material, but shall maintain the same in a neat and orderly condition throughout the construction period. On or before the completion of the work, the Contractor shall carefully clean out all pits, chambers or conduits and shall tear down and remove all temporary structures provided by him and shall remove rubbish of all kinds from any of the grounds which he has occupied and leave them in first-class condition to the satisfaction of the Engineer.

The Contractor is advised that the final cleanup of the project shall be done with meticulous care.

Ps. 2 CONSTRUCTION

Ps. 2.01 GENERAL

The Contractor shall perform his work in such a manner as not to harm the undisturbed condition of the underlying or adjacent soils or damage or prevent the proper placement of fill. The Contractor shall bear the cost of any repair required by the Engineer as a result of unnecessary disturbance of soils adjacent to the construction area.

a) Removal of Obstructions

Unless otherwise noted, the Contractor shall remove all brush, trees, logs, stumps, roots, heavy sods, heavy growth of grass, all decayed vegetable matter, fences and all structures where the proper construction and completion of the work require their removal. Disposal of this material shall be at the Contractor's expense.

Material that is removed as herein specified shall be disposed of on the Plant Site as directed by the Engineer.

b) Excess Excavated Material

Excess excavated material shall be removed from the site for disposal on the Plant Site by the Contractor at his expense.

c) Shoring, Sheeting and Bracing

Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained, and except as shown or specified otherwise, removed by the Contractor.

All sheet piling, shoring, sheeting and bracing shall be designed by a Professional Engineer engaged by the Contractor with demonstrated competence and experience in such work. The sheeting system shall be designed to prevent bottom failure and hydrostatic uplift within the excavation. Provision shall also be made in the design for lateral pressures due to side slope and construction equipment or other surcharge loads, as applicable.

The Contractor shall provide to the Engineer for his review, design calculation and arrangement drawings of the sheeting system prior to ordering any materials for bracing, sheeting, etc., and prior to the commencement of the excavation.

All material, except as otherwise specified, used for sheeting and sheet piling, lagging, braces, shores and stringers, or waling strips shall be of approved quality and dimensions throughout.

Materials for sheeting systems shall be furnished and driven or set in place by the Contractor, where necessary or wherever ordered by the Engineer, whether the same is or is not considered necessary by the Contractor. If, in the opinion of the Engineer, the material furnished by the Contractor is not of proper quality or sufficient size or not properly placed to ensure the safety of the work or of adjacent structures and property, the Contractor shall, upon notice from the Engineer to that effect, forthwith procure, furnish and set in place or drive other and satisfactory material, or place the material in a satisfactory manner; and if he shall fail or neglect to do so, the Engineers may order all or any part of the work to be stopped until such material so used is furnished and placed; and the Contractor shall not be entitled to claim, demand or receive any compensation for larger size or better quality or different disposal of material ordered by the Engineer, nor any compensation for allowance of any kind whatsoever for or on account of any damage or delay resulting from such stoppage of work.

Steel sheet piling may be either new or used. It shall be of adequate strength, straight and properly braced. Steel sheet piling shall be of the interlocking type. Friction in the interlocks shall not be assumed to contribute to the strength of the sheet piling.

The design, planning, installation and removal, if required, of all sheet piling, shoring, sheeting and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.

Steel sheet piling for the excavation shall be driven straight and in line. The piling shall be supported above ground, before driving, by a guide frame at least 20 feet high which will keep the piling accurately in the required position and vertical. Each piece of piling shall be driven only a few feet at a time and driving shall proceed continuously around the perimeter so that the piles shall reach their full penetration together.

Walers and bracing shall be supplied and installed as required to complete the sheeting system. Walers and braces shall be of adequate strength for the loads imposed. Splices in walers shall develop the full strength of the member in bending, shear and axial compression.

If bracing members are to be removed during construction, the timing and procedure for removal shall not induce excessive stresses in the permanent structures or in steel sheet piling and bracing members.

If the construction sequence of structures requires the transfer of bracing to the completed portions of any structure, the

Contractor shall secure written acceptance of the Engineer prior to the installation of such bracing.

In trenching operations the use of horizontal strutting below the barrel of pipe or the use of the pipe as support for trench bracing will not be permitted. The use of a traveling shield for sewer construction shall require that the device be approved for use by a Professional Engineer. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loadings which might overload the pipe.

The neglect, failure or refusal of the Engineer to order the use of sheeting, or sheet piling, or steel or to order the same to be left in place, or the giving or failure to give of any order or directions as to the manner or methods of driving or placing sheeting, sheet piling, bracing, shores, etc., shall not in any way relieve the Contractor of any or all obligations under this Contract. Sheeting left in place shall be cut off 1' below existing grade.

The rules of the OSHA and the State Department of Labor with respect to excavation and construction shall at all times be strictly observed.

d) Control of Water

All excavation and placement of sewers, backfill and fill shall be carried out in the dry. The Contractor shall furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during construction, and shall dewater and dispose of such water as directed by the Engineer. He shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage, and shall have available at all times competent workmen for the operation of the pumping equipment. The dewatering systems shall not be shut down during work stoppage without written permission from the Engineer. All collected groundwater shall be disposed of at the on-site holding tank as directed by the Engineer.

The control of groundwater shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" during excavation shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils.

During excavation, construction of structures, installing of pipelines and sewers, placing of structures and trench backfill and the placing and curing of concrete, excavations shall be kept free of water. The Contractor shall control surface runoff so as

to prevent entry or collection of water in excavations. Before dewatering is started, the Contractor shall obtain acceptance by the Engineer for the method, installation and details of the dewatering system he proposes to use.

The release of ground water to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines or sewers.

Ps. 2. 02 INITIAL SOIL EXCAVATION AND DISPOSAL

The Contractor shall excavate all soils to a depth of one foot between the upgradient containment wall and City owned streets; between the upgradient containment wall and the storm sewer; and within the temporary easement east of the storm sewer. Excavation and disposal shall include all topsoil, trees, gardens, shrubs, etc. and shall be within the areas indicated on the Contract Drawings.

All excavated areas shall be backfilled with 6 inches of clean imported fill and with 6" of topsoil placed as a final course, and shall be restored to their original or better condition including replacement of shrubs, gardens and seeding all to the satisfaction of the City of St. Louis, the private property owners, and the Engineer.

Ps. 2. 03 TRENCH EXCAVATION

Unless otherwise specified or indicated, the Contractor may use any method of excavation which will not damage or endanger adjacent structures or property or disturb the natural or fill soils below and adjacent to the excavation. In no case during any pipe laying shall excavation advance more than two pipe lengths ahead of the last installed section of pipe.

Where, in the opinion of the Engineer, the undisturbed condition of the natural soils is inadequate for the support of the planned pipeline or sewer, the Engineer shall direct the Contractor to overexcavate to adequate supporting soils and refill the excavated space to the proper elevation in accordance with the procedure specified for backfill. Where so directed by the Engineer, the excavation, removal of excavated material as specified, furnishing and placement of such material in excess of the quantities shown on the drawings will be paid for under the appropriate item of the Additional Unit Prices.

Should the excavation be carried below the lines and grades indicated on the drawings because of the Contractor's operations, the Contractor shall refill such excavated space to the proper elevation as directed. Should the natural or fill foundation soils be disturbed or loosened because of the Contractor's operations, they shall be recompacted or removed and the space refilled as directed at the Contractor's expense.

Should the storm sewer excavation along Washington Avenue (M-46) between the concrete headwall and MCB 3 be to the extent that the existing 8" watermain is uncovered, the Contractor shall propose a method approved by the Engineer and the City of St. Louis, of supporting the watermain such that the watermain is not damaged in any way. Upon backfilling of the trench, select granular material shall be well compacted around the watermain in order that the watermain is left in its original or better condition. Any damage to the watermain by the Contractor during construction or required restoration shall be repaired immediately by the Contractor at his own expense.

Except as permitted by the Engineer, the trench at the end of the day shall not be excavated in advance of pipe laying and shall be fully backfilled with granular material, except where the trench is fully shielded. The Contractor shall, at the end of the day, secure any shielded area of trench which is left open by surrounding it with snow fencing.

Ps. 3 STORM SEWERS

Ps. 3.01 EXTENT OF WORK

- a) The work shall consist of site clearing, removal of topsoil, trench excavation, bedding and backfill, restoration and all other work necessary for the complete construction of storm sewers and appurtenances.
- b) Trees, fences, shrubs and other vegetation designated by the Engineer will be carefully protected and saved from injury during the construction operation.

Ps. 3.02 MATERIALS

1. General

- a) All materials required for the performance of this Contract with the exception of topsoil or clay fill shall be supplied by the Contractor.
- b) All materials supplied by the Contractor shall be delivered to and stored on the site in a manner satisfactory to the Engineer. All fabricated materials shall be inspected by the Contractor for damage in transit.
- c) No defective material shall be delivered to the site and materials found defective at any time shall be removed immediately and replaced at the Contractor's expense.

2. Concrete Pipe

- a) Reinforced concrete sewer pipe shall be used for storm sewers and shall comply with ASTM Specification C-76, or latest revision with "B" wall. Classes shall be as shown on the Contract drawings and as described in the Form of Bid.
- b) For storm sewers, rubber-type gasket joints shall comply with ASTM Specification C-443, or latest revision, and be designed to meet the test requirements specified in Clause 4.11.

3. Corrugated Metal Pipe

Corrugated metal pipe shall comply with AASHO Specification M-36 or latest revision, and shall be to the U. S. Standard gauges shown on the drawings. The pipe shall have a standard two ounce galvanized coating and joints shall be bolted.

4. Precast Manholes and Manhole Catchbasins

- a) All manholes shall have a reinforced 3000 p. s. i. concrete base constructed as shown on Contract Drawings. A precast base may be used if the base is placed on 6" of compacted granular "6A" (100% Standard Proctor) extending 12" beyond the outside diameter of the base.
- b) All manhole risers, tops and bases shall be precast reinforced concrete in accordance with ASTM Specification C-478, or latest revision.

5. Cast Iron Frames, Covers and Side Inlet Castings

Frames and covers for manholes and manhole catchbasins shall be in accordance with the most current municipal standards or as shown on the Contract Drawings and Specifications.

6. Manhole Bricking

Manholes and catchbasin tops shall be brought to final grade using approved bricking. Bricking shall be placed no more than 5 rows high and no less than 3 rows high.

7. Bedding & Backfill Material

All storm sewer bedding and backfill shall be Class "6A" bedding, as specified on the Contract Drawings. The bedding shall be compacted to a density of 95% standard proctor maximum density.

8. Manhole Steps

All manhole steps shall be manufactured of hot dipped galvanized iron as shown on the Contract Drawings.

Ps. 3. 03 TOPSOIL UTILIZATION

- a) Topsoil, if suitable for sodding and seeding and if directed by the Engineer, will be stripped from within the limits of excavation excluding areas detailed in Section Ps. 2. 02 in advance of construction and stockpiled in areas designated by the Engineer.
- b) Topsoil excavated from the areas outlined in Section Ps. 2. 02 shall be disposed of on the Plant Site.
- c) On completion of the backfill of the trench, the topsoil shall be spread as directed by the Engineer.

Ps. 3.04 LINE AND GRADE

- a) The Contractor shall supply, erect and maintain approved batter boards and sight rails to ensure accurate line and grade of all pipes. At least 3 batter boards shall be in use at all times, placed not more than 50 feet apart. The Contractor may use other methods of setting line and grade such as laser providing the method is approved by the Engineer.
- b) No deviation from the line and grade set out by the Engineer will be tolerated, except where changes in direction or the laying of pipes along a curve are limited to the pipe manufacturer's tolerances for joints.
- c) Test for Line and Grade: During pipe laying between adjoining manholes or structures, light from the beginning end of each straight or working section of the sewer shall remain constantly in plain view throughout the entire length of such section, and shall show the true character and shape of the interior surface of the sewer, which shall be circular in form. This test will be applied to each completed working section of sewer before its acceptance. The Contractor shall take up and relay all pipe which is not in true alignment or shows any settlement after laying.

Ps. 3.05 TRENCH EXCAVATION

- a) Trenches shall be dug to the alignment and depth required.
- b) Trench Width
 - i) The transition trench width shall be applicable in all cases except when otherwise specified on the Contract Drawings.
 - ii) The following conditions shall apply when width is specified.
 - a) Minimum - The width of trenches shall be such as to give a maximum clearance of 12 inches on each side of the barrel of the pipe, plus the actual additional width required for sheeting and shoring.
 - b) Maximum - The width of the trench at the top of the pipe shall be not greater than 2 feet, plus the outside diameter of the pipe.
- c) The width of the trench at ground level will not be less than the width at any depth in the trench. Fill overbreak and slides which have occurred during excavation will be excavated and backfilled with approved materials.
- d) Where trench excavations are not kept within the design limits of the pipe, the Engineer may order sheeting and shoring, and/or a heavier class of pipe, and/or use of a higher class of bedding. No extra payment will be made for such remedial action.

- e) The pipe trench shall be graded and shaped and the specified bedding shall be provided, to give uniform and even bearing for the length of the pipe, and bell holes shall be dug at each joint. All correction in the grade shall be made with compacted granular material acceptable to the Engineer, or with fill concrete, all at the Contractor's expense.
- f) Ledge rock, boulders and masonry shall be removed to provide a clearance of at least 6 inches below and on all sides of the pipe or structure.
- g) Where the subgrade is inadequate to support the pipe, the Engineer will instruct the Contractor as to the proper procedure, and such additional work so ordered will be paid for as described in the Form of Bid.
- h) All native material excavated by the Contractor along the line of the trench shall be transported, disposed and covered with clean clay fill on the Plant Site in an area designated by the Engineer. No native material shall be used as trench backfill.

Ps. 3.06 LAYING AND JOINTING OF PIPE

- a) All pipe shall be laid and jointed in strict accordance with the manufacturer's recommendations and instructions, and with the approval of the Engineer.
- b) The laying of the pipe shall start at the lowest pipe and shall be laid upgrade, with the bell or socket pointing upstream. The pipes shall be firmly fixed and accurately set to line and grade during construction of the specified bedding, with the inverts smooth and uniform.
- c) Pipe which is not true to alignment or which shows any settlement after laying shall be taken up and relaid entirely to the satisfaction of the Engineer and at the expense of the Contractor.
- d) All pipe joints shall have approved rubber gaskets. Prior to inserting the spigot into the bell, the surface of both bell and spigot shall be wiped clean and lubricated with a liberal coating of an approved vegetable base soap compound such as linseed soap. The rubber gasket shall also be coated with the lubricating soap and then stretched uniformly over the spigot end and seated in the gasket groove or recess. In cold weather, the Contractor shall use a small amount of glycol base anti-freeze for thinning.

Ps. 3.07 BEDDING

The trench shall be backfilled and compacted for a specified height above the top of the pipe, in accordance with the details described in Section Ps 3.02.7, and Ps 3.15.

Ps. 3. 08 SEWER TO BE KEPT CLEAN

- a) During the progress of the work and until the completion and final acceptance, the sewer and connections shall be kept clean and free of water. If, in the final inspection of the sewer, any obstruction or deposit is discovered, it shall be removed by the Contractor.
- b) If it should be considered necessary by the Engineer, after the sewers have been laid and backfilled a wood or metal ball two inches less in diameter than the sewer shall be pulled through each section of the sewer. Should, for any reason, the ball not easily pass through the sewer, the Contractor shall open up the defective portion and repair it. The cost to test and repair shall be borne by the Contractor.

Ps. 3. 09 LENGTH OF OPEN TRENCH

The Contractor shall not continue excavation and pipe laying at any time when two or more manholes, including benching, are incomplete.

Ps. 3. 10 PROTECTION OF PIPES FROM DAMAGE

The Contractor shall assume full responsibility for the protection of pipes from crushing after backfilling. Where pipes are laid with shallow cover, the Contractor shall barricade the trench to protect the pipe from damage by trucks or other heavy equipment.

Ps. 3. 11 MANHOLE BENCHING

- a) Manholes shall be benched with 3,000 p. s. i. concrete. Channelling shall have a semi-circular bottom and vertical sides extending up to 0.8 of the pipes diameter entering or leaving the manhole. Ledges at the side of channels shall have a slope of one inch per foot unless shown otherwise on the drawings.
- b) Where there is a difference in elevation between the incoming and the outgoing pipe, the channelling shall slope downward from the higher pipe at a slope not steeper than 1 to 1, except where shown otherwise on the drawings or as directed by the Engineer.

Ps. 3. 12 CONNECTION OF EXISTING SEWERS

- a) All connections of existing sewers to new sewers shall be made at a time and in a manner approved by the Engineer. No connections shall be made until the new downstream sewers have been inspected, tested and approved by the Engineer.

- b) The Contractor shall supply all labour, materials and equipment to block up, divert or pump flows in existing sewers, so that benching can be completed satisfactorily and not be damaged subsequently. High early strength or "quick set" admixtures approved by the Engineer may be used in the grout and concrete and shall be at the Contractor's expense.

Ps. 3. 13 ELEVATION OF MANHOLES AND CATCHBASINS DURING CONSTRUCTION

- a) Manholes and catchbasins shall be constructed such that not less than 3 nor more than 5 courses of manhole brick or approved equivalent will be required to adjust the cast iron frames to final elevation.
- b) Cast iron frames shall initially be set on the concrete at the time of construction and shall be adjusted to final elevation at the time of final grading.
- c) Catchbasins shall at all times be capable of receiving surface drainage. Bricks may be omitted during the construction of roads to ensure surface drainage, but brick openings shall be sealed before roads have been completed.

Ps. 3. 14 INFILTRATION AND EXFILTRATION TESTING

Maximum permissible infiltration or exfiltration shall be 300 gallons per inch of pipe diameter per mile of sewer per 24-hour day, with a static head of 3 feet above the crown of the pipe at the high end of the line. The Contractor shall supply all materials and labor to conduct infiltration or exfiltration tests that may be ordered by the Engineer.

Ps. 3. 15 BACKFILLING

- a) The Contractor shall complete the specified type of bedding and shall obtain the Engineer's approval of the specified bedding, before any backfilling.
- b) Backfilling of all trenches shall be carried out continuously and immediately after the specified bedding has been completed and approved by the Engineer.
- c) The trench between the top of the specified bedding and finished road subgrade shall be backfilled with imported select granular material placed in layers not exceeding 12 inches and shall be compacted to a density of at least 95% standard proctor maximum density. Trenches not under travelled surfaces of existing roads shall be backfilled to finished surface elevation in the same manner.

- d) Backfill materials shall not contain any:
 - i) Trees, stumps, branches, or any other wood or lumber.
 - ii) Topsoil, sod, leaves or any other organic material.
 - iii) Boulders, rock, masonry or concrete larger than 6 inches measured through any axis.
 - iv) Excess concrete not used in any structure.
 - v) Wire, steel, cast iron, cans, drums or any other foreign materials.
 - vi) Site materials not eliminated above, that contain water in excess of their optimum moisture content.
- e) Frozen materials may not be used for backfill.
- f) Soil density tests will be ordered by the Engineer, at the expense of the Owner, to prove that the general directions described above for granular bedding and trench backfilling have been followed. The re-excavation, backfilling and additional compaction expense shall be borne by the Contractor.

Ps. 3. 16 DISPOSAL OF EXCESS EXCAVATED MATERIAL

Surplus excavated material shall be hauled, placed, spread, and covered with clean fill on the Plant Site as directed by the Engineer. The costs associated with the disposal of the material shall be the responsibility of the Contractor.

Ps. 4 CAST IN PLACE CONCRETE

Ps. 4. 01 GENERAL

This work shall consist of all labor and material required for mixing, proportioning, testing, placing and finishing plain and reinforced cast in place concrete including forming, reinforcing, curing and related work.

Ps. 4. 02 MATERIAL

a) Cement

Standard Portland Cement, conforming to ASTM C150, Type II.

b) Aggregate

(i) Coarse

Normal weight, conforming to ASTM C33. Aggregate to be hard, durable, uncoated, uncracked gravel with specific gravity approximately 2.62.

(ii) Fine

Clean, hard, durable uncoated grains, free from loam, silt and clay, and conforming to ASTM C33.

c) Admixtures

(i) Air Entraining Agent

Conforming to ASTM C260. "Darex AEA" (W.R. Grace Co.) or MB-AE10 (Master Builders) or approved equal.

(ii) No other admixtures will be permitted. In particular calcium chloride based compounds are specifically barred.

d) Reinforcing Steel

Grade 60, new billet steel conforming to ASTM A615.

e) Anchor Bolts

Carbon steel conforming to ASTM A36 with heavy hex heads.

Ps. 4. 03 PROPORTIONING

a) Concrete

- (i) All concrete for all parts of the work shall be of the specified quality capable of being placed without excessive segregation, and when hardened, of developing all characteristics required by these specifications.
- (ii) All concrete used shall be 3,000 p. s. i.
- (iii) Entrained air content to be $6\% \pm 1\%$ by volume.
- (iv) At least 90% of the design water must be added at the concrete batch plant.
- (v) Slump shall be $4" \pm 1/2$ inch.
- (vi) All concrete must be delivered to the site between 60° and 80° F.

Ps. 4. 04 FORMWORK

Forms shall be designed, constructed, installed and maintained so as to ensure that after removal of forms, the finished concrete will have true surfaces free of waviness or bulges, conforming accurately to the indicated shapes, dimensions, lines, and elevations. Form surfaces that will be in contact with concrete shall be thoroughly cleaned before each use.

Ps. 4. 05 CONCRETE PLACEMENT

All concrete shall be placed in accordance with specifications by the American Concrete Institute (ACI 304-73) and as specified herein.

a) Preparation for Placing

All hardened concrete, debris and foreign materials shall be removed from the interior of forms and from inner surfaces of mixing and conveying equipment. Reinforcement shall be secured in position, and shall be inspected and approved by the Engineer before placing concrete. Runways shall be provided for wheeled concrete-handling equipment; such equipment shall not be wheeled over reinforcement nor shall runways be supported on reinforcement.

b) Placing Concrete

Concrete shall be handled from mixer to transport vehicle to place of final deposit in a continuous manner, as rapidly as practicable, without segregation or loss of ingredient until the approved unit of operation is completed. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper finishing and curing of the concrete. Concrete shall be placed in the forms, as close as possible in final position in uniform approximately horizontal layers not over 12 inches deep. Forms splashed with concrete which subsequently hardens and reinforcement splashed with concrete which subsequently hardens or form coating, shall be cleaned in advance of placing subsequent lifts. Concrete shall not be allowed to drop freely more than 5 feet in unexposed work nor more than 3 feet in exposed work. Conduits and pipes shall not be embedded in concrete unless specifically indicated.

Ps. 4.06 COMPACTION

Immediately after placing, each layer of concrete shall be compacted by internal concrete vibrators supplemented by hand-spading, rodding and tamping.

Ps. 4.07 FINISHES

a) Exposed Edges

- (i) Provide 1 inch chamfer where specifically designated on drawings.
- (ii) Except where chamfer is called for, edge-tool top horizontal edges of all exposed structures.
- (iii) Remove fins and burrs and patch voids or irregularities in all other exposed vertical edges.

Ps. 4.08 CURING - SEALING

Concrete shall be maintained in a moist condition at temperatures above 40°F for a minimum of 7 days. Concrete shall be protected from rapid temperature change and rapid drying for the first 72 hours following the removal of temperature protection. Curing activities shall be started as soon as free water has disappeared from the surface of the concrete after placing and finishing.

a) Moist Curing

Unformed surfaces shall be covered with burlap or mats, wetted before placing and overlapped at least 6 inches. Burlap or mats shall be kept continually wet and in intimate contact with the surface. Where formed surfaces are cured in the forms, the forms shall be kept continually wet. If the forms are removed before the end of the curing period, curing shall be continued as on unformed surfaces, using suitable materials. Burlap shall be used only on surfaces that will be unexposed in the finished work and shall be in two layers.

b) Membrane-Forming Compound Curing

The compound shall be applied on damp surfaces as soon as the moisture film has disappeared. The curing compound shall be applied by power spraying equipment using a spray nozzle equipped with a wind guard. The compound shall be applied in a two-coat, continuous operation at a coverage of not more than 400 square feet per gallon for each coat. When application is made by hand sprayers, the second coat shall be applied in a direction approximately at right angles to the direction of the first coat. The compound shall form a uniform, continuous, adherent film that shall not check, crack or peel, and shall be free from pinholes or other imperfections. Surfaces subjected to rainfall within 3 hours after compound has been applied, or surfaces damaged by subsequent construction operations within the curing period shall be immediately resprayed at the rate specified above. Where membrane forming curing compounds are permitted, permanently exposed surfaces shall be cured by use of a nonpigmented membrane-forming curing compound containing a fugitive dye. Where nonpigmented-type curing compounds are used, the concrete surface shall be shaded from the direct rays of the sun for the curing period. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic and from other sources of abrasion and contamination during the curing period.

Ps. 4.09 TESTING AND INSPECTION

- a) Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not present rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.
- b) Testing agencies shall meet the requirements of "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel in Construction" ASTM E-324-70.
- c) The following tests shall be performed by the Owner or a designated agency and shall be paid for by the Owner.

- (i) Secure composite samples in accordance with "Method of Sampling Fresh Concrets" ASTM C172-71.
- (ii) Mold and secure specimens from each sample in accordance with "Method of Making and Curing Concrete Test Specimens in the Field" ASTM C31-69.
- (iii) Test specimens in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" ASTM C39-72. Two specimens shall be tested at 7 and 28 day strengths.
- (iv) Make one strength test for each 50 cubic yards or fraction thereof, (or as directed by the Owner) of each mix design of concrete placed in any one day.
- (v) Determine slump for each strength test. The slump tests shall be determined at the beginning of each, the middle of, and the end of a particular mixer/agitator truck which is selected for testing. In addition, slump tests shall be taken whenever and at the discretion of the Owner the consistency of the concrete seems to vary. The slump shall be determined using the "Method of Test for Slump of Portland Cement Concrete" (ASTM C143-71).
- (vi) Determine total air content of normal weight concrete sample for each strength test in accordance with "Method of Test of Air Content of Freshly Mixed Concrete by the Pressure Method" ASTM C231-72T or "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" ASTM C173-75.
- (vii) Determine temperature of concrete sample and mixing water for each strength test and as required by the Owner. Determine the temperature of aggregates, cement water and the mixture thereof at the batch plant as required by the Owner.

Ps. 5 RIP RAP

Ps. 5.01 GENERAL

This work shall consist of constructing a protective covering of approved stone without mortar on an earth bed, and shall include the required excavating, trimming and consolidating of foundations as directed, and will include the hauling and delivery of all rock and other material, and all labor and equipment incidental to the handling and placing.

Ps. 5.02 MATERIAL

The quality of rock or concrete fragments shall be approved by the Engineer. Rock or concrete subject to marked deterioration by water or weather will not be accepted.

Crushed rock shall be quarried stone of good quality with no more than 10% passing the 3 inch sieve.

Ps. 5.03 CONSTRUCTION

Where and as directed by the Engineer, excavation shall be performed to provide a shelf or ledge to retain the rock so dumped as permitted under this section.

The Contractor may use quarry run rock fragments but excluding those fragments smaller than the sizes hereinbefore specified. Such material may be placed by dumping it into position over the surface to be rip rapped, or placed by derrick or other approved means. A reasonable endeavour shall be made to place the larger fragments at the bottom of the slopes. Material sized larger than 12 inches shall be placed and graded by size up the slope with the larger sizes placed at the toe of the slope. Placing shall be done in such a manner that the surface of the finished rip rap shall have a uniform appearance.

The finished rip rap protection layer shall average 12 inches in thickness with a tolerance of ± 3 inches.

Ps. 6 UPGRADIENT CONTAINMENT WALL CONSTRUCTION

Ps. 6.01 GENERAL

The work shall consist of constructing an impervious continuous soil/bentonite containment wall along the upgradient side of the Plant Site as shown on the Contract Drawings. Included in the containment wall construction shall be the excavation of material for a working platform centred along the line of the containment wall; construction of a control berm between the line of the containment wall and the property boundary fence line using imported clean clay fill; and furnishing all labor, plant, equipment and material required to effectively complete the upgradient containment wall construction.

Ps. 6.02 MATERIAL

All material used on this Contract must be approved by the Engineer prior to use.

a) Bentonite

The bentonite used for this Contract shall be Slurry Gel #125 by International Minerals and Chemical Corporation or an approved equal naturally powdered, pure, premium grade Wyoming type, sodium cation-base bentonite consisting mainly of the clay mineral sodium montmorillonite and displaying high swelling characteristics. All bentonite used shall meet the standards outlined in the current API specifications 13A "Oil Well Drilling Fluid Materials". Each shipment of bentonite when received on-site, shall be furnished with written Certification of Compliance in quadruplicate and a copy of the test reports from the bentonite manufacturer verifying that the bentonite is a premium grade natural bentonite meeting the requirement of API specifications 13A. Copies of the certification and the test reports shall be submitted to the Engineer for his review and subsequent submittal to the EPA/MNDR upon receiving each shipment of bentonite. No bentonite shall be used until the Contractor has received approval from the Engineer that the bentonite is of premium quality. Bentonite not meeting specifications shall be promptly removed from the site of work and replaced with bentonite conforming to specifications.

The use of chemically pretreated bentonite will not be allowed on any portion of this Contract.

b) Water

The Contractor shall be responsible for securing a suitable source of water for bentonite slurry mixing. The water shall be fresh and clean and must meet the standards specified below:

- 1) A pH \geq 7.0
- ii) Calcium < 500 ppm
- iii) Oil, organics, acids, alkali, soluble salts, or other deleterious substances < 50 ppm each

The Contractor shall submit test results to the Engineer prior to commencing any slurry mixing, verifying that the water quality meets the stated specifications.

c) Slurry Control Agents

The use of thinners, dispersants and flocculants may be used by the Contractor to attain and control standard properties of the slurry, particularly the apparent viscosity, gel strength, and filtration characteristics provided the final properties of the soil bentonite wall are not altered. The Contractor shall inform and receive approval from the Engineer of any additives to be used.

Peptizing or bulking agents will not be permitted for mixing with slurry.

d) Imported Clay

Clay used for construction of the working platform and the control berms adjacent to the containment wall shall be clean clay soil obtained from the approved borrow pit located as shown on the Contract Drawings. Clay shall be removed from the borrow pit only at locations as directed by the Engineer.

e) Native Soil

Native soils excavated from the containment wall trench shall be used in the containment wall backfill except for areas judged unsuitable by the Engineer.

f) Imported Fill

Material used for backfill mix in areas in which native material is determined to be unsuitable shall be sandy clay material imported from the approved Project borrow pit. Backfill material must contain greater than 25% plastic fines (25% soil particles passing a U. S. Standard No. 200 Sieve).

Ps. 6.03 MIXING OF SLURRY

a) Equipment

The Contractor shall provide a continuous venturi type mixer capable of producing a colloidal suspension of bentonite in water for preparation of all slurry. The slurry mixing plant shall include a mechanically agitated sump, pumps, valves, hoses, supply lines, small tools and all other plant and materials required to adequately supply slurry to the trench.

The Contractor shall construct adequate containment areas for the storage and hydration of mixed slurry. After mixing, slurry shall be pumped to the holding ponds for final hydration of the bentonite. The ponds shall be sized to provide an adequate supply of slurry for 3 to 4 days of construction in case of equipment failure or in case of a substantial loss of slurry in the trench should a highly pervious strata be encountered. The ponds shall be located in an area approved by the Engineer. The Contractor shall restrict his plant activities within this designated area, unless given approval by the Engineer to expand or move his plant to other areas of the Plant Site.

Slurry within the hydration ponds shall have Marsh funnel tests performed on it, as a minimum, three (3) times daily. Additional tests shall be performed on the slurry after a rainfall to maintain the proper physical properties.

The construction of the holding ponds shall be such that no material is excavated on the Plant Site. All material used for the holding ponds must be clean imported material from the approved borrow pit.

At the completion of the Contract the Contractor shall dispose of excess slurry in an area approved by the Engineer and cover the spoiled slurry with clean imported clay. The slurry holding pond areas shall be regraded and covered with clean imported clay fill.

b) Mixing

The bentonite slurry for supporting the sides of the trench and for mixing with the backfill material shall consist of a suitable suspension of a quality natural bentonite and clean water thoroughly mixed and agitated to avoid formation of lumps. Mixing shall be continued until the bentonite particles are fully hydrated and the slurry appears to be at the proper consistency. At no time shall the slurry be mixed in the trench.

Mixing operations shall not be carried out when ambient temperatures are below 35 degrees F. Should the Contractor anticipate temperatures below 35 degrees F, he must take precautionary measures to protect slurry in the containment areas and in the trench from freezing using suitable approved cover.

After mixing, the slurry shall be pumped into the slurry containment areas to allow the bentonite to expand fully. The Contractor shall provide a means of agitating and recirculating the slurry in the containment areas in order to maintain a homogeneous slurry mixture. The slurry shall be pumped from the containment area to the excavated trench when required.

The Contractor shall ensure that the slurry level in the trench is kept at a minimum three (3) feet above the groundwater level. Should a sudden drop in the slurry level occur or a sudden rise in the groundwater occur, the Contractor must immediately make the appropriate adjustment to the slurry level in the trench.

The Contractor shall keep personnel on call weekends and holidays to ensure that the slurry level in the trench remains at least three (3) feet above the groundwater level.

c) Slurry Properties

Flow properties and control limits of the slurry as specified herein shall be determined according to procedures outlined in the API Recommended Practice 13B, "Standard Procedures for Testing Drilling Fluids" or unless otherwise specified herein.

When pumped from the slurry containment areas to the trench, the slurry must have the following properties:

- i) Apparent viscosity of 40 seconds Marsh
- ii) Density \geq 67 pcf
- iii) pH \geq 7.0

Continual testing of the slurry in the trench shall be carried out throughout the slurry construction in order that the following slurry properties are maintained within the trench:

- i) An apparent viscosity of 40 seconds Marsh
- ii) Slurry density less than 15 pcf that of backfill material
- iii) $7.0 \leq$ pH < 12.0

Should the slurry fall below the stated limits at any time during construction of the upgradient containment wall, the Contractor shall immediately recirculate, remove or adjust the slurry such that it complies with the above specifications.

Ps. 6.04 EXCAVATE WORKING PLATFORM

Prior to commencing the upgradient containment wall trench excavation a level working platform shall be constructed centered along the line of the containment wall.

The working platform shall be constructed on line and level, and shall, as a minimum, be twelve (12) feet in width. Material excavated for the working platform shall be disposed on the Plant Site in an area designated by the Engineer. Clay used to backfill the working platform shall be from the approved Project borrow pit from locations as directed by the Engineer and shall be compacted to 98% maximum modified Proctor Density.

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Ps. 6.05 CONSTRUCT CLAY CONTROL BERM

A clay control berm shall be constructed, as shown on the Contract Drawings, along the Plant Site property to prevent run-off of any slurry material or rainwater onto adjacent properties. Extreme care shall be taken to preserve and maintain the berm throughout the duration of the Contract.

The berm shall be constructed using clay from the approved project borrow pits to the line and grades approved by the Engineer and shall be compacted in 12 inch lifts to 90% maximum modified Proctor Density. The top of the berm shall be kept a minimum of 24 inches above existing grades.

At the completion of the containment wall construction the Contractor shall remove the outside control berm by grading to the proposed final base contours.

Ps. 6.06 CLAY, FILL AND TOPSOIL BORROW PIT

A source of clay, fill and topsoil has been identified and secured by the owner and its location is indicated on the Contract Drawings.

Clay, fill and topsoil excavation shall proceed in an orderly fashion, to lines and grades as approved by the Engineer.

Materials rejected at the borrow site by the Engineer shall be spoiled on-site to lines and grades as approved by the Engineer.

NO (Dewatering shall be carried out as required by the Contractor. Collected water shall be discharged to an adjacent natural watercourse in a manner satisfactory to the Engineer.

All applications, permits and fees necessary to transport topsoil, fill and clay soil from the borrow area to the site of work shall be the responsibility of the Contractor.

The Contractor shall post and maintain road signs at the borrow pit area indicating "Caution - Trucks Turning". Signs shall be visible from both approaches to the pit area.

The Contractor shall keep all County roads free of mud, soil and other debris tracked by haulage units.

Following completion of borrow operations, the borrow site shall be regraded and cleaned to the satisfaction of the Engineer.

All costs involved in the development, operation, maintenance (including surface and groundwater control and pit haul roads) and restoration of the borrow area shall be included in the appropriate bid unit prices for clay, fill and topsoil.

PS. 6.07 ON-SITE HAUL ROADS

On-site haul roads are presently located on the Plant Site as shown on the Contract Drawings. Maintenance of these haul roads and construction of any new haul roads shall be the responsibility of the Contractor. The cost of such haul road construction or maintenance shall be included in the Bid Prices for Phase I construction work.

On-site haul roads shall be maintained in a condition satisfactory to the Engineer.

Ps. 7 SLURRY TRENCH EXCAVATION

Ps. 7.01 GENERAL

The excavation of the slurry containment wall shall be in accordance with these specifications and along the line and grades shown on the Contract Drawings. Throughout the entire Contract, excavation of the trench shall be from a level clay working platform, a minimum, twelve (12) feet in width and centered along the line of the containment wall.

Ps. 7.02 EQUIPMENT

The Contractor shall carry out the trench excavation using any suitable earthmoving equipment such as backhoes, draglines, clamshells, or any combination thereof provided the equipment can perform the required work as specified. The equipment shall be capable of excavating the 24" wide trench in one pass to the depths specified on the Contract Drawings.

Equipment used for mixing the backfill shall be a suitable type of earthmoving or grading equipment such as a bulldozer, blade grader or blender that are capable of thoroughly mixing the backfill material into a homogenous consistency.

Ps. 7.03 ALIGNMENT AND DIMENSIONS

Excavation of the upgradient containment wall trench shall be to the lines and grades shown on the Contract Drawings. The trench shall be 24 inches wide and shall be to a depth such that the wall is keyed into the underlying clay till layer 36 inches. Any excess excavation of the slurry trench for the convenience of the Contractor or for any other purpose shall be at his expense unless otherwise directed in writing by the Engineer. All areas of overexcavation shall be backfilled with material approved by the Engineer, at the Contractors expense.

The Contractor shall be responsible for continually monitoring the trench excavation to ensure the plumbness of the trench walls.

At points of direction change having a radius less than 30 feet or at 90° corners, the Contractor shall ensure continuity of the wall by excavating beyond the centerline of the wall a minimum of ten (10) feet. This additional excavation shall be included in the bid price for the wall construction. Extreme care shall be taken by the Contractor to excavate all material at these direction changes ensuring that no windows of unexcavated material remain within the backfilled containment wall.

Throughout the course of the trench excavation, the Contractor shall profile the trench by passing the digging tool horizontally and vertically over the full depth and length of the excavated trench.

prior to placing backfill in the trench. Sediment that collects in the bottom of the trench shall be removed with excavating equipment or with an air lift pump.

During the entire upgradient containment wall installation, representatives from Velsicol and from the EPA/MDNR shall be present to witness the native material excavated from the trench at 25 foot intervals in order to certify that the containment wall has been founded in clay. The Contractor shall at all times accommodate and assist as necessary the aforementioned representatives.

It is anticipated that material excavated between stations 2 + 20 and 5 + 95; and between stations 9 + 75 and 11 + 50; will be unsuitable for use as backfill due to rubble buried along the line of the wall. The Contractor shall dispose of this excavated material in an area on the Plant Site designated by the Engineer and cover the disposed material with 12" of clean fill.

Backfill for the Containment wall shall be imported from the approved Borrow pit from locations as directed by the Engineer. The Contractor shall ensure that the imported backfill is thoroughly mixed with the bentonite slurry to design mix prior to backfilling the trench.

Borelogs taken along the line of the upgradient containment wall indicating the depth to clay till and the nature of soils to be excavated during the wall construction are provided within Appendix B.

Ps. 7.04 TESTING

Throughout the construction of the upgradient containment wall the Contractor shall be responsible for performing quality control testing to monitor the quality of all construction material and to ensure the maintenance of slurry and backfill mixing properties. Results of all quality control testing shall be included within the daily report filled out by the Contractor and made available to the Engineer each day. As a minimum the Contractor shall be responsible for performing the following quality control tests:

- i) Slump Cone Test
 - one test performed for every twenty-five (25) cubic yards of backfill mix
- ii) Gradation test
 - four tests performed on backfill mix per eight (8) hour shift
- iii) Methylene Blue Test
 - four test performed on backfill mix per eight (8) hour shift
- iv) Unit Weight
 - Performed on slurry samples pumped from bottom of trench and on backfill mix being added to trench at least once each hour of working shift

should engineer do testing.

- v) Marsh Funnel Test
 - four tests performed on slurry in trench per eight (8) hour shift
 - four tests performed on slurry in holding ponds per eight (8) hour shift. Increase to one test per hour during and for one day after rainfall.

In addition the Engineer will collect representative samples for testing during the upgradient wall construction as verification of material properties. The Engineer shall perform the following testing:

- i) Triaxial Permeability Test
 - performed on cores taken from each 500 lineal feet of installed 7 to 10 days after containment wall is completed, prior to installing clay cap over wall.
- ii) Slump Cone Test
 - one test performed for every one hundred (100) cubic yards of backfill mix
- iii) Gradation Test
 - one test performed on backfill mix per eight (8) hour shift
- iv) Methylene Blue Test
 - one test performed on backfill mix per eight (8) hour shift
- v) Unit Weight
 - performed on slurry samples pumped from bottom of trench and on backfill mix being added to trench at least two times per working shift
- vi) Marsh Funnel Test
 - one test performed on slurry in trench per eight (8) hour shift
 - one test performed on slurry in ponds per eight (8) hour shift
 - two tests performed on slurry in ponds per eight (8) hour shift during and for one day after rainfall.

The Contractor shall provide assistance as required by the Engineer in the collection and testing of samples.

Ps. 7. 05 EMERGENCY PROCEDURES ALONG EXCAVATION

In the highly unlikely event that barrels, canisters or chemical gases or vapors are uncovered during the upgradient containment wall construction the following procedures shall be followed:

i) Vessels

In the event that barrels or canisters are encountered during excavation all work shall immediately cease and all workmen be removed from the work area. Velsicol officials shall be

immediately notified and they shall identify vessel contents, handling procedures and storage and disposal techniques prior to re-commencing work.

ii) Excessive Chemical Gases or Vapors Generated from Excavated Face

In the event of excessive gases or vapors along the trench excavation, the following actions will be taken:

- a) Remove all workers from the area.
- b) Monitor contaminant concentrations to determine the type of respiratory protective device that will be required before workers re-enter the area.

iii) Major Leak of a Toxic Gas

In the highly unlikely event of a major leak of toxic gas, such as might occur if a compressed gas cylinder were encountered and ruptured during excavation, all on-site personnel will be evacuated to a safe distance and the "Emergency Contingency and Response Plan", as proposed in Section Ps. 12.10, shall be implemented.

Ps. 7.06 ADDITIONAL SOIL EXCAVATION AND DISPOSAL

Material lying between the line of the containment wall and City of St. Louis roadways running adjacent to the Plant Site, shall be excavated to a depth of one (1) foot and disposed of on the Plant Site in the area shown on the Contract Drawings or in an area specified by the Engineer. Material to be excavated includes all topsoil, trees, gardens and shrubs within the top foot of material.

Upon completion of the excavation, all excavated areas shall be backfilled with clean imported topsoil and the lands shall be restored to their original or better condition, including replacement of all shrubs and trees removed, and seeding of the area.

Ps. 8 TRENCH BACKFILLING

Ps. 8. 01 GENERAL

The Contractor shall not begin backfilling the upgradient containment wall trench until the Engineer is satisfied that both the backfill and the trench have been sufficiently tested and that the results of the tests meet the required standards.

Ps. 8. 02 MATERIAL

Native soil excavated from the containment wall trench shall be mixed with the bentonite slurry and used as backfill for the trench. The backfill shall be kept free from roots, organic matter, peat, diatomaceous earth, or other deleterious materials. Should the Engineer deem that the excavated material is unsuitable, the Contractor will be instructed to import material suitable for backfill from the approved Project borrow pit.

Backfill material, whether obtained on-site or imported shall be suitable material containing greater than 25% plastic fines. Backfill material larger than three (3) inches will not be accepted. All excavated material rejected as suitable backfill shall be disposed on the Plant Site in an area decided upon by the Engineer.

Ps. 8. 03 MIXING AND PLACEMENT

Mixing of the backfill shall take place adjacent to the slurry trench excavation using equipment that will guarantee thorough mixing of the excavated material and the bentonite slurry. Mixing equipment shall not run any closer than 15 feet to the edge of the trench. The slurry used for backfill mixing shall be taken from the trench, not the hydration ponds.

Should addition of dry bentonite be required to achieve a 3% by dry weight soil/bentonite backfill the additional bentonite shall be evenly distributed over the soil backfill prior to blending with slurry. The dry bentonite shall be well mixed with the soil backfill using mechanical mixers or harrows.

Backfill material shall not have a bentonite content greater than 3% by dry unit weight and when placed in the trench shall have a slump of two (2) inches to six (6) inches. Slump shall be determined using the method outlined in the slump cone testing Specification ASTM C 143-66. Sluicing of backfill mix with water to produce the desired slump will not be permitted.

Backfilling of the excavated trench shall not commence until the Engineer has satisfied himself that the trench and backfill material meet the specifications and not until the excavation of the trench is at least 100 feet ahead of the backfilling. When the backfilling operation commences, the toe of the backfill slope in the trench shall be no more than 250 feet and no less than 100 feet away from the toe of the trench excavation.

Backfill material shall be placed in the trench, no sooner than 24 hours after excavation begins, at its natural angle of repose, at a point where the backfill rises to the top of the working platform. As the trench is backfilled the slurry should be displaced along the trench. No free dropping of backfill material into the trench shall be permitted.

The Contractor shall be responsible for maintaining and protecting the containment wall in place from damage caused by differential hydraulic pressures, equipment travel and all other possible damaging influences.

Ps. 8. 04 CONTAINMENT WALL CAP

Upon completion of the soil-bentonite containment wall and all subsequent quality control testing the Contractor shall construct a clay cap over the wall to prevent groundwater from filling the trench and to prevent drying and cracking of the soil/bentonite wall. Clay for the cap shall be obtained from the approved sources and shall be placed in 12 inch lifts compacted to a minimum density of 90% modified Standard Proctor. Capping shall not commence for at least 1 week after backfilling the trench.

The Contractor shall construct an access structure over the completed containment wall at the south and north access gates to allow the travel of loaded trucks and heavy equipment over the wall. These access structures shall be maintained in place for the duration of all construction work at the Plant Site and shall be left in place at the completion of the Contract.

Ps. 9 INTERNAL GROUNDWATER COLLECTION SYSTEM

Ps. 9.01 EXTENT OF WORK

- a) The work shall consist of site clearance, trench excavation, bedding and backfill, dewatering, restoration and all other work necessary for the complete construction of the two internal groundwater collection system interceptors within the northern sector of the Plant Site. Each interceptor shall be constructed to within 50 feet of their respective manholes.

Ps. 9.02 MATERIALS

1. General

- a) All materials, with the exception of clay fill, required for the performance of this Contract shall be supplied by the Contractor.
- b) All materials supplied by the Contractor shall be delivered to and stored on the site in a manner satisfactory to the Engineer. All fabricated materials shall be inspected by the Contractor for damage in transit.
- c) No defective material shall be delivered to the site and materials found defective at any time shall be removed immediately and replaced at the Contractor's expense.

2. Perforated Clay Pipe

Perforated Clay pipe for the collection system construction shall be Logan clay perforated pipe or approved equal with self centering joints, and shall comply with ASTM Specifications C-700. Perforated pipe shall be extra strength pipe with 1/4"Ø perforations. Configuration of the perforations shall be as shown on the Contract Drawings.

3. Bedding Material

All collection system bedding shall be approved Michigan Department of Transportation '6A' granular material as shown on the Contract Drawings. The bedding shall be compacted to a density of 95% Standard Proctor Density.

4. Backfill Material

All collection system backfill shall be Class I granular material as shown on the Contract Drawings. The backfill shall be compacted to 95% Standard Proctor Density.

Ps. 9.03 LINE AND GRADE

- a) The Contractor shall supply, erect and maintain approved batter boards and sight rails to ensure accurate line and grade of all subdrains. At least 3 batter boards shall be in use at all times, placed not more than 50 feet apart. The Contractor may use other methods of setting line and grade such as laser providing the method is approved by the Engineer prior to use.
- b) No deviation from the line and grade set out by the Engineer will be tolerated, except where changes in direction or the laying of pipes along a curve are limited to the pipe manufacturer's tolerances for joints.
- c) To test for line and grade during pipe laying between adjoining manholes or structures, elevation and alignment surveys will be made by the Engineer at a minimum of 25 feet intervals along the installed collection system interceptors. This test will be applied to each completed working section of collection system before its acceptance. The Contractor shall take up and relay all pipe which is not in true alignment or shows any settlement after laying.

Ps. 9.04 TRENCH EXCAVATION

- a) Trenches shall be dug to the alignment and depth required.
- b) Trench Width:
 - i) The transition trench width shall be applicable in all cases except when otherwise specified on the Contract Drawings.
 - ii) The following conditions shall apply when width is specified
 - a) Minimum - The width of trenches shall be such as to give a maximum clearance of 12 inches on each side of the barrel of the pipe, plus the actual additional width required for sheeting and shoring.
 - b) Maximum - The width of the trench at the top of the pipe shall be not greater than 3 feet, plus the outside diameter of the pipe.
 - c) The width of the trench at ground level will not be less than the width at any depth in the trench. Fill overbreak and slides which have occurred during excavation will be excavated and backfilled with approved materials.

- d) Where trench excavations are not kept within the design limits of the pipe, the Engineer may order sheeting and shoring, and/or a heavier class of pipe, and/or use of a higher class of bedding. No extra payment will be made for such remedial action.
- e) The pipe trench shall be graded and shaped and the specified bedding shall be provided, to give uniform and even bearing for the length of the pipe, and bell holes shall be dug at each joint. All correction in the grade shall be made with compacted granular material acceptable to the Engineer, or with fill concrete, all at the Contractor's expense.
- f) Ledge rock, boulders, masonry and other debris shall be removed to provide a clearance of at least 6 inches below and on all sides of the pipe or structure.
- g) Where the subgrade is inadequate to support the pipe, the Engineer will instruct the Contractor as to the proper procedure, and such additional work so ordered will be paid for as described in the Form of Bid.

Ps. 9.05 LAYING AND JOINTING OF PIPE

- a) All pipes shall be laid and jointed in strict accordance with ASTM C-12 "Standard Practise of Installing Vitriified Clay Pipe Lines" and the manufacturer's recommendations and instructions, and with the approval of the Engineer.
- b) The laying of the pipe shall start at the lowest pipe and shall be laid upgrade, unless otherwise instructed by the Engineer. The pipes shall be firmly fixed and accurately set to line and grade during construction of the specified bedding, with the inverts smooth and uniform.

Ps. 9.06 BEDDING

The trench shall be backfilled and compacted for a specified height above the top of the pipe, in accordance with the details described in Section Ps 9.02.3, and Ps 9.10.

Ps. 9.07 SUBDRAIN TO BE KEPT CLEAN

During the progress of the work and until the completion and final acceptance, the collection system and connections shall be kept free of sediment or debris. If, in the final inspection of the collection system any obstruction or deposit is discovered, it shall be removed by the Contractor.

Ps. 9. 08 LENGTH OF OPEN TRENCH

The Contractor shall not continue excavation and pipe laying at any time when two or more manholes, including benching, are incomplete.

Ps. 9. 09 PROTECTION OF PIPES FROM DAMAGE

The Contractor shall assume full responsibility for the protection of pipes from crushing after backfilling. Where pipes are laid with shallow cover, the Contractor shall barricade the trench to protect the pipe from damage by trucks or other heavy equipment.

Ps. 9. 10 BACKFILLING

- a) The Contractor shall complete the specified type of bedding and shall obtain the Engineer's approval of the specified bedding, before any backfilling.
- b) Backfilling of all trenches shall be carried out continuously and immediately after the specified bedding has been completed and approved by the Engineer.
- c) The trench shall be backfilled in layers not exceeding 12 inches and shall be compacted to a density of at least 95% Standard Proctor Density.
- d) Soil density tests may be ordered by the Engineer, at the expense of the Owner, to confirm that the specifications described herein for granular bedding and trench backfilling have been followed. Re-excavation, backfilling and additional compaction expense if required to meet the specifications shall be borne by the Contractor.

Ps. 9. 11 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- a) Material excavated from the trench shall be hauled, placed and spread on the Plant Site as directed by the Engineer. Disposed trench spoils shall be covered with 12" of clean imported clayey fill placed in 6" lifts compacted to 90% maximum dry density.
- b) Due to the nature of the fill material presently on the Plant Site concrete and/or steel including piping may be encountered during trench excavation. In most cases the alignment of the pipe has been adjusted to avoid these areas. This material, if encountered shall be broken up or cut up into manageable sizes and disposed of on the Plant Site in an area designated by the Engineer.
- c) In addition to concrete and steel buried on the Plant Site subsurface piping exists within certain areas along the line of the subdrain. The Contractor shall cut the piping off five feet

on either side of the subdrain trench and plug the opened ends of pipe with concrete. All pipe shall be disposed on-site as directed by the Engineer. At no time will any piping leave the site for salvaging.

The Contractor shall note that some of the subsurface piping may be filled with unknown material. During pipe removal Contractor personnel shall use self-contained air respirators when in the pipe trench or adjacent to the work area. The Contractor shall submit his proposed plan for severing piping in a safe manner, to the Engineer for approval, prior to commencing subdrain installation.

Ps. 9. 12 GRANULAR INTERCEPTOR SUMPS

A fifteen (15) foot square granular sump shall be constructed at the upgradient ends of all interceptor drains as detailed on the Contract Drawings. The capped ends of the interceptors shall be extended half way into the sumps. Granular material for the sumps shall be Class "I" granular material compacted to 95% Standard Proctor Density.

Ps. 9. 13 DEWATERING

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The Contractor shall be responsible for maintaining the trench excavation in a dry condition during the subdrain installation as specified in Section Ps. 2.01(d). All groundwater collected from the collection system trench excavation shall be disposed of in the on-site holding tank.

Ps. 10 FINAL COVER

Ps. 10.01 GENERAL

The work included within this section includes all labor and materials required to place the final clay cover over the northern sector of the Plant Site including installation of the gas venting systems within this area, all of which is covered under Phase I construction indicated on the Contract drawings.

Prior to commencing the capping of the Plant Site the Contractor shall ensure that the Plant Site has been graded and compacted to the base contours shown on the Contract Drawings. All areas of the Plant Site sub-base shall be compacted to 90% Standard Proctor Density.

Ps. 10.02 MATERIAL

All material used on this Contract shall be approved by the Engineer prior to use.

a) Clay Capping Material

Clay material used for the final cap shall be clean clay soil imported from the approved borrow pit from locations as directed by the Engineer. Clay material for the lower 18 inches of the clay cap shall have a gradation of less than 18 percent of soil particles smaller than 0.005 millimeters in diameter and the top 18 inches of the clay cap shall have a gradation of more than 18 percent of soil particles smaller than 0.005 millimeters in diameter. Both materials shall have a minimum of 45 percent fines passing the 200 sieve (clay, classified as CL or ML under the Unified Soils Classification System or defined by ASTM D-421-58 and D-422-63 procedures).

Determination of particle size distribution for use as capping material shall be made by the Engineer at the pit at a minimum rate of one sample for each 10,000 cubic yards of material to be removed.

b) Coarse Filter

Coarse filter material used for the gas vent installation shall be approved Michigan Department of Transportation '6A' coarse aggregate.

c) Medium Filter

Medium filter material used for the gas vent installation shall be Class "I" filter material.

d) Gas Vent Pipe

Fabrication for the gas venting pipe shall be as detailed on the Contract Drawings. Pipe used for the vents shall be 4" Schedule 40 steel pipe.

Ps.10.03 GAS VENTS

Installation of the gas vents shall be carried out following capping of the Plant Site. The work shall involve installing the vents in locations shown, and as specified on the Contract Drawings.

Material excavated during the installation of the vents shall be disposed of in an area specified by the Engineer. Disposed material shall be covered immediately with 12 inches of imported clean clayey fill and compacted to 90% Standard Proctor Maximum Density.

Ps.10.04 PROOF ROLL ENTIRE SITE PRIOR TO INSTALLATION OF CLAY CAP

Prior to clay cap installation, the portion of the site to be capped shall be proof rolled with a proof roller of between 35 and 50 tons static weight.

Settlements or subsidence caused by proof rolling shall be filled to original ground elevation with clay fill material obtained from the approved project borrow pit and compacted to 90% standard proctor density .

Proof rolling shall continue until, in the opinion of the Engineer, all areas exhibit a satisfactory structural condition.

Under no circumstance shall any clay cap material be placed until such time as the area has been proof rolled to the satisfaction of the Engineer.

Ps.10.05 EXCAVATE, TRANSPORT, PLACE AND COMPACT CLAY CAP

a) Place Clay Cap

Areas on which waste material has been disposed shall be capped with 36 inches of clay and all other areas shall be capped with 18 inches of clay. Delineation of the two areas is indicated on the Contract Drawings.

Clay shall be placed in 6 inch lifts ^D compacted to 98% Modified Proctor Density, as outlined in ASTM 1557, at a moisture content of +1% of its optimum moisture content as determined from time to time by a materials testing engineer retained by the Owner. Determination of moisture content shall be carried out as determined by ASTM D2216.

Compaction tests and moisture density determinations shall be carried out by the Engineer of material in place at a frequency of one test for each 1,000 cubic yards of clay placed.

Capping material shall be tested at the pit by the Engineer. Tests to be performed are:

- 1) Particulate size gradation such that more than 18% of the soil particles are less than 0.005 millimetres in diameter in the top 18 inches of clay cap and less than 18% are less than 0.005 millimeters in the bottom 18 inches of clay cap, as

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defined by the ASTM D-421-58, or D-422-63 as reapproved in 1972; performed on one sample for every 10,000 cubic yards of material to be placed.

- ii) Atterberg limits; performed on one sample for each 10,000 cubic yards of clay to be placed.
- iii) Plastic limit; performed on one sample for each 10,000 cubic yards of clay to be placed.
- iv) Redetermination of Proctor Density of capping material by Modified Proctor, as outlined in ASTM D 1557, one sample for each 5,000 cubic yards of capping material to be used, or whenever the texture of the capping material changes.

The Contractor shall assist the Engineer in obtaining all samples throughout the clay cap placement.

All clay placed shall meet compaction specifications. Should compaction specifications not be met, the affected area shall be reworked and recompact until subsequent testing confirms compliance. Clay shall not be placed until underlying lifts have been approved by the Engineer.

The finished surface of the capped site shall be smooth and free from any irregular surface changes and shall conform to the final grading plan shown on the Contract Drawings.

b) Dust Control

The Contractor shall keep the site, adjacent areas, and haul roads free from excess dust and airborne particulate matter.

As directed by the Engineer, the Contractor shall apply water or calcium chloride to work areas, access roads or County and State Highways in proportions and frequencies as approved by the Engineer.

A mechanical road sweeper shall be provided as directed by the Engineer. Collected material shall be disposed on the Plant Site as directed by the Engineer.

c) County Roads and State Highways

As a condition of this Contract, the Contractor shall limit the travel of loaded trucks or heavy equipment between the site of the work and the clay-topsoil borrow pit to the following roads:

1. Riverside Drive between the clay-topsoil borrow pit and Prospect St.
2. Prospect St. between Riverside Drive and Main St.
3. Main St. between Prospect Street and Washington Ave.
4. Main St. between Prospect Street and Center Street (alternative).
5. Washington Ave. between Main St. and the Plant Site.

6. Center Street between Main St. and North Mill Street (alternative).
7. North Mill Street between Center Street and North Avenue (alternative).
8. North Avenue between North Mill Street and the Plant Site (alternative).

The Contractor shall be responsible for all cleaning, maintenance and repair to State, County, or Municipal Highways travelled by his equipment or vehicles during the course of the work.

All haul roads between the borrow pit and the site shall be maintained during the course of the work in a condition satisfactory to the Engineer and the Gratiot County Roads Commissioner. In no event shall the condition of these road cause hardship or difficulty in travel to the local residents. This requirement is of top priority and should be especially noted by the Contractor.

At the completion of work requiring travel of trucks loaded with clay, fill, or topsoil, the haul roads between the borrow pit and the work site shall be restored to a condition suitable for resurfacing. This will include filling and compacting potholes, removal and disposal of existing ravelled or damaged surface, and fill and compaction of shoulders. All such restoration work shall be completed to the satisfaction of the Engineer and the Gratiot County Roads Commissioner.

d) Clay Fill and Topsoil Borrow Pit

A source of clay fill, and topsoil has been identified and secured by the Owner, and its location is indicated on the Contract Drawings.

Topsoil shall initially be stripped and stockpiled as required for further use.

Clay fill and soil excavation shall proceed in an orderly fashion and to lines and grades as approved by the Engineer and shown on the Contract drawings.

Materials rejected at the borrow site by the Engineer shall be spoiled on site to lines and grades as approved by the Engineer.

All applications, permits and fees necessary to transport topsoil, fill, and clay soil from the borrow area to the site of work shall be the responsibility of the Contractor.

Following completion of borrow operations, the borrow pits shall be regraded and cleaned to the satisfaction of the Engineer.

All costs involved in the development, operation, maintenance (including surface and groundwater control) and restoration of the borrow area shall be included in the appropriate bid unit prices for clay fill, and topsoil.

Ps. 11 LANDSCAPING

Ps. 11.01 GENERAL

The work shall consist of the supply and placement of topsoil, lime, fertilizer, grass seed and mulch over all disturbed areas or private property and property owned by the City of St. Louis as indicated on the Contract Drawings. The Contractor shall supply all labor, material and equipment necessary to fully complete this landscaping in all respects.

Ps. 11.02 MATERIALS

a) Topsoil

Topsoil shall be fertile loamy material free from roots, vegetation, weeds, parts of weeds, weed seeds and other debris. The source of topsoil shall be an area free from growth of Quackgrass, Japanese Clover, Horsetail, Morning Glory, and other persistent weed plants. Topsoil should be free from stones and clods over two inches in diameter.

Topsoil shall not be obtained from swampy areas and shall not be infested with the seeds of noxious weeds. The pH of the topsoil shall be between 5.5 and 7.0.

Topsoil shall be inspected and approved by the Engineer prior to delivery to the job site.

A sufficient supply of topsoil will be available from the site of the Project borrow pit.

b) Seed

Grass seed is to be obtained from a recognized seed house and shall be supplied in the following mix quantities per acre.

90 lbs. Creeping Red Rescue, Ruby
50 lbs. Blue Grass, Park Variety
10 lbs. White Clover
20 lbs. Perennial Ryegrass
3/4 bu. Spring Oats
30 - 40 lbs. Ammonium Nitrate

c) Fertilizer

Fertilizer shall be a standard commercial fertilizer with a ratio of 6-12-12. Fertilizer shall be stored in a dry area and shall be kept free flowing and free from lumps.

Fertilizer for top dressing shall be ammonium nitrate.

d) Water

Water used for hydraulic seeding shall be free of any impurities which would inhibit germination or otherwise adversely affect growth.

e) Mulch

Mulching material shall be oat or wheat straw free from weeds and all other foreign matter. Mulch shall be used dry.

f) Asphalt Emulsion

Asphalt emulsion to be used as an adhesive with the mulching material shall be a specially refined petroleum asphalt emulsified in water, containing no petroleum solvents or other components known to be toxic to plant life.

It shall be of fluid consistency, designed for cold spray applications and shall be so manufactured and stored as to show no separation of the asphalt.

Asphalt emulsion shall conform to the following specific requirements:

Viscosity, 60 mL @ 77°F., SSF	17 - 40
Residue by Distillation, %	55 - 58
Settlement, 7 days %	5.0 Max.
Demulsibility, 50 mL of 0.10N CaCl ₂	2.0 Max.
Sieve Test	0.10 Max.

Tests of Residue from Distillation:

a) Penetration, 77°F., 100 g, 5 Sec.	100 - 200
b) Solubility, CCl ₄ , %	97.5 Min.
c) Ductility, 77°F., cm	40 Min.

Fireproofness Pass

Methods of testing shall be in accordance with ASTM Designation D244, except that for the Settlement Test the settlement period shall be 7 days, for the Solubility Test the Solvent shall be carbon tetrachloride, and the fireproofness requirement shall be met if there is no flash or flame when the flame of a bunsen burner is held in contact for 10 seconds with the surface of the material, as received.

Adhesive materials for mulch other than asphalt emulsion will be considered as alternatives upon written application to the Engineer.

Approval by the Engineer of an alternate mulch adhesive will not increase the price of the work.

g) Sod

Sod, if required, shall be mature nursery grown sod well permeated with roots. The sod shall be uniform in texture, free from weeds and be in a healthy condition with no sign of decay.

All sod is to be delivered to the job within 24 hours of being cut and shall be placed within 36 hours of being cut. The sod shall contain sufficient moisture to maintain its vitality during transportation and placement. Sod shall be sprayed with water and covered with moist burlap if required to prevent its drying out before laying.

Sod may be rolled to facilitate handling and transportation and shall be in widths not less than 12" nor more than 18", in lengths not less than 14" nor more than 6', in thickness not less than 1 1/2".

Sod shall contain Merian Blue and/or Kentucky and/or Creeping Red Fescue grasses and shall not contain more than thirty (30) percent of other common grasses.

h) Sod Pegs

Sod pegs shall be at least one inch square and 18 inches long with one end pointed.

Ps. 11. 03 CONSTRUCTION METHODS

a) Topsoil Placement

Prior to seeding, the Contractor shall uniformly spread topsoil over the entire work area to a depth of 6 inches. All clods and lumps shall be pulverized and any roots and foreign matter shall be raked up and removed. The entire topsoil area shall be raked to a uniform finish.

b) Seeding

The grass seed and fertilizer shall be uniformly spread over the entire work area with an approved hydraulic seeder. The quantities of materials to be charged into the seeder shall be measured by weight or by a system of weight-calibrate volume. The Contractor shall provide all equipment for this purpose.

No area shall be seeded which cannot be mulched on the same day as it is sown.

Seeding is to be completed prior to September 1 of any given year.

c) Mulching

Mulch material shall be applied with an approved mulch blower and shall be sufficiently dry that it can be processed through the blower without stoppage.

Mulch shall be applied evenly over all seeded areas at the rate of 2.5 tons per acre.

To facilitate tying the mulch down, asphalt emulsion shall be sprayed into the air stream of the mulch blower at a rate sufficient to form an effective, cohesive mat. The emulsion application rate shall not be less than 150 gallons per acre. The emulsion shall be distributed uniformly throughout the mulch material by not less than two nozzles.

d) Placing of Sod

Before placement of sod, if required, fertilizer is to be uniformly applied at a rate of 500 lbs. per acre. This shall be incorporated into the topsoil by raking, discing or harrowing. Fertilizer shall be applied not more than 48 hours before the sod is placed.

Sod shall be neatly and evenly placed so that the appearance on completion shall be as nearly as possible that of a good natural growth in place. Where sodding meets seeded areas, the sod shall be countersunk to the existing grade level at the edges to permit the free flow of water across the joint.

e) Pegging Sod

On slopes, sod shall be laid lengthwise across the face of the slope with the ends close together. Joints in adjacent rows shall be staggered. Joints and broken sod shall be pounded to a uniform surface. On slopes 3:1 and steeper, sodding shall be pegged as follows:

On slopes steeper than 1 3/4:1 each and every row of sod shall be pegged; on slopes from 1 3/4:1 to 3:1 each of the bottom three rows and each third row above shall be pegged.

In a pegged row of sod, the pegs shall be uniformly spaced across the face of the slope at uniform intervals of not greater than 24" such that when the sods therein are:

- (a) 24" or less in length, there shall be a peg in each sod.
- (b) greater than 24" but not greater than 48" there shall be two pegs in each sod.
- (c) greater than 48" but not greater than 72" there shall be three pegs in each sod. The pegs shall be driven flush with the sod.

The Contractor shall water the sod as required to establish good growth. Water shall be applied in a manner that the newly sodded surface shall not be eroded, washed out or damaged in any way. No additional payment shall be made for watering of the sod.

f) Fertilizing

300 lbs. per acre of fertilizer is to be thoroughly disced into the surface of the topsoil prior to seeding.

Weed killer will be applied only as required, and approved, by the Engineer.

g) Overlap

Where the work adjoins existing vegetation the Contractor shall overlap the seed and mulch material to bond the new growth intimately to the existing growth.

h) Weather and Seasonal Conditions

Work shall only be done when the ground is free of snow, ice or standing water and when the opinion of the Engineer, weather and seasonal considerations are suitable. Work will not be permitted to proceed when wind conditions are such that material would be carried beyond the designated work area or that materials would not be uniformly applied.

Ps. 11. 04 TESTING

Materials shall be tested to confirm compliance with specifications at a frequency as determined by the Engineer. Upon request, the Contractor shall submit to the Engineer samples in volumes and containers as directed.

The cost of initial or primary testing shall be borne by the Owner. Should it be necessary to conduct subsequent testing due to initial non-compliance of samples with specification, all cost of such testing shall be the responsibility of the Contractor.

Ps. 11. 05 MAINTENANCE

The Contractor is responsible for establishing vegetative cover and shall re-seed any areas that do not properly take or are not adequately covered.

Maintenance shall continue until preliminary acceptance of the entire project, and shall include watering, mowing, and any other operations, including re-seeding as necessary to produce a close stand of grass over the entire designated area.

In no event will acceptance for this portion of the work be granted until establishment of vegetative cover and after second cutting.

Ps. 12 HEALTH AND SAFETY

Ps. 12.01 SCOPE

The installation of the Upgradient Containment Wall and the internal groundwater collection system will involve excavation into soils and groundwater that may contain chemical materials including pesticides, brominated and chlorinated hydrocarbons, and organic solvents. The Contractor shall submit with his Bid, a Project Health and Safety Plan, which will be reviewed by the Engineer and the Owner. The successful Bidder shall not commence work until his Health and Safety Plan has been reviewed and approved by both the Engineer and Owner, and until all provisions of the Health and Safety Plan are in effect.

The Health and Safety Plan shall provide for a safe and minimal risk working environment for on-site personnel and shall minimize the impact of construction activities on the general public and the surrounding environment. The development and maintenance of the Project Health and Safety Plan is the Contractor's responsibility. However, as a minimum, the plan shall address the specifications contained hereafter.

Should the Contractor seek relief from, or substitution for any portion or provision of the Health and Safety Plan, such relief or substitution shall be requested of the Engineer in writing, and if approved, be authorized in writing. Interpretation of this section shall be the exclusive prerogative of the Engineer.

Ps. 12.02 BASIS

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) shall provide the basis for the safety and health program. The program shall also reflect the position of EPA and NIOSH regarding procedures required to insure safe operations at sites containing hazardous or toxic materials.

The safety and health of the public and on-site personnel, and the protection of the environment shall take precedence over cost and schedule considerations for all project work. The Owner's on-site coordinator (OSC), the Engineer, and the Contractor's Safety Officer shall be responsible for decisions regarding when work shall be stopped or started for health or safety considerations.

Ps. 12.03 SAFETY OFFICER

The Contractor shall provide a designated site Safety Officer who shall have a minimum of three years working experience in the chemical and chemical waste disposal industry; who shall have a sound working knowledge of State and Federal occupational safety and health regulations; and who shall have formal educational training in occupational safety and health.

The Safety Officer shall:

- ✓ a) Be responsible for the implementation, enforcement and monitoring of the safety and health plan;
- ✓ b) Ensure that all on-site personnel have obtained the required medical examinations prior to and at the termination of work;
- c) Be responsible for the pre-construction indoctrination of all on-site personnel with regard to this safety plan and other safety requirements to be observed during construction, including: (i) potential hazards, (ii) personal hygiene principles, (iii) personnel protective equipment, (iv) respiratory protection equipment usage and fit testing, and (e) emergency procedures dealing with fire and medical situations;
- d) Be responsible for alerting appropriate off-site emergency services and the Engineer before starting any particularly hazardous work; and
- e) Be responsible for the maintenance of separation of "Contaminated" (Dirty) and "Uncontaminated" (Clean) areas as described hereafter.
- f) Preparation and maintenance of an on-site emergency contingency plan.

Ps. 12 04 CUSTODIAN

✓ The Contractor shall employ and provide a custodian who shall be responsible for keeping all safety equipment and project facilities clean, properly equipped, and maintained.

Ps. 12 05 MEDICAL SURVEILLANCE

✓ The Contractor shall retain the services of an occupational physician to provide the medical examinations and surveillance specified herein. The name of the physician and evidence of examination of all on-site personnel shall be provided to the Engineer prior to assigning personnel on-site.

All on-site personnel involved in this project shall be provided with medical surveillance within 15 days prior to entering the site, within 30 days after leaving the site, and at any time there is suspected excessive exposure to toxic chemicals or physical agents.

Medical surveillance protocol is the physician's responsibility but shall meet the requirements of OSHA standard 20 CFR 1910.134 for all personnel. Normally this would include:

- a) Baseline Examination: Medical history; general physical; EKG; SMA 26; urinalysis; serum cholinesterase; methemoglobin; urine heavy metals; and chest x-ray.

- b) Follow-up Examination: SMA 26; CBC; urinalysis; serum cholinesterase; urine heavy metals; and methemoglobin.

The Contractor shall maintain all medical surveillance records for a period of twenty (20) years and shall make those records available to governmental agencies as required by State and/or Federal regulations.

Ps. 12 06 TRAINING

The Contractor shall provide and require that all personnel assigned to or entering the site, complete training or refresher sessions. Training and refresher sessions shall ensure that all personnel are capable of and familiar with the use of safety, health, respiratory and protective equipment and with the safety and security procedures required for this site.

The Safety Officer shall be responsible for ensuring that personnel not successfully completing the required training are not permitted to enter the site to perform work.

Exceptions to the above shall be made only by the OSC or the Engineer for authorized visitors.

Ps. 12 07 RESPIRATOR PROGRAM

All on-site personnel shall receive extensive training in the usage of, both half and full face respirators. This shall include canister/cartridge and supplied air types.

The respirator program shall be administered by the Safety Officer.

Ps. 12 08 WORK AREAS

The Contractor shall clearly layout and identify work areas in the field and shall limit equipment, operations and personnel in the areas as defined below.

- 1) "Dirty" Area (Hazardous Work or Contaminated Zone) - This shall include all areas where contaminated soils are being excavated, handled, spoiled or covered, and all areas where contaminated equipment or personnel travel. For the purpose of this Contract the dirty area shall be deemed to include all lands within the Velsicol property boundaries.

The level of personnel protective equipment required in this area shall be determined by the Safety Officer and the Engineer after monitoring and on-site inspection.

- ii) Decontamination Zone - This zone shall occur at the interface of "Dirty" and "Clean" areas and shall provide for the transfer of construction materials from clean to site dedicated equipment, the decontamination of equipment and vehicles prior to entering

the "Clean" Area, the decontamination of personnel and clothing prior to entering the "Clean" Area, and for the physical segregation of the "Clean" and "Dirty" Areas.

iii) "Clean" Area - This area is the remainder of site and is defined as being an area outside the zone of significant air, soil or surface water contamination. The "Clean" Area shall be clearly delineated and procedures implemented to prevent active or passive contamination from the work site. The function of the "Clean" Area includes:

- 1) An entry area for personnel, material and equipment to the "Dirty" Area of site operations;
- 2) An exit area for decontaminated personnel, materials and equipment from the "Dirty" Area of site operations;
- 3) The housing of site special services; and
- 4) A storage area for clean safety and work equipment.

The "Dirty Area" shall be clearly delineated in the field by the existing boundary fence line. In areas where the boundary fence line is removed, the Contractor shall erect temporary fencing to delineate the dirty zone. Haul roads within the Plant Site boundary deemed to be clean, shall be delineated from the dirty zone using stakes and flagging. All site dedicated equipment shall be prohibited from travelling on clean haul roads.

Ps.12.09 SECURITY

The Contractor shall provide a Security Officer(s) at site entrances currently being used. The Security Officer(s) shall:

- a) provide and maintain site security during working hours
- b) limit vehicular access to the site to authorized vehicles and personnel only
- c) maintain a visitors and site personnel sign-in sign-out log, and a log of all security incidents
- d) provide initial screening of site visitors
- e) post and maintain all required signs

Ps.12.10 EMERGENCY AND FIRST AID EQUIPMENT AND SUPPLY

The Contractor shall provide an emergency medical facility in the decontamination zone. This facility is described in Section Ps.13.02.

The safety equipment listed below shall be located and maintained within the "Dirty" Area in appropriate locations as directed by the Safety Officer.

- i) portable emergency eye wash and showers
- ii) stretcher
- iii) twenty pound ABC type dry chemical fire extinguishers
- iv) self contained air full face respirators

As a minimum the Contractor shall have one Certified First Aid Technician on-site at all times. This person may perform other duties but must be immediately available to render first aid when needed.

PS. 12.11 EMERGENCY CONTINGENCY AND RESPONSE PLAN

a) Off-Site Contingency Plan

Prior to commencing work, the Contractor shall assist the OSC and the Engineer in the coordination and development of an off-site emergency contingency plan. This plan is intended to provide immediate response to a serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from the site into adjacent public areas.

Co-ordination meeting shall be held with appropriate authorities including the City, Engineer, Fire, Hospital, State and City Police, State Department of Transportation, and Civil Defence officials. The meetings shall identify the off-site Emergency response co-ordinator through whom all information and co-ordination will occur in the event of an incident. Plans shall be developed, or existing plans incorporated into the master plan, for

- i) evacuation of adjacent areas
- ii) fire fighting procedures
- iii) transport of injured personnel to medical facilities
- iv) priority transportation routes
- v) co-ordination and/or modification of highway operations

Techniques and recommended procedure for immediate first aid emergency response shall be developed with local medical facilities.

b) On-Site Contingency Plan

- i) Procedures and protocols for the immediate handling and treatment of injured on-site personnel shall be developed and submitted to the Engineer for approval prior to commencing site work.
- ii) Fire fighting equipment shall be maintained in strategic locations within the site to combat localized fires. Personnel shall be trained in fire fighting procedures and shall be equipped with self contained air respirators when involved in such operations.

- iii) In the event of significant release of toxic or hazardous vapors from any excavation, the source of such vapors shall be immediately backfilled or covered with fill. Alternate plans of contaminant removal shall be developed and submitted to the Engineer prior to recommencing work in the area.

Ps. 12.12 PERSONAL SAFETY AND RELATED EQUIPMENT

The Contractor shall provide all on-site personnel with appropriate personal safety equipment and protective clothing. The Contractor shall ensure that all safety equipment and protective clothing is kept clean and well-maintained. As a minimum, the Contractor shall supply:

- a) Work clothing (pants, shirt, socks, underwear)
- b) Disposable outerwear such as coveralls, gloves, hardhat liners, and foot coverings. Coveralls shall be impervious to liquids
- c) Hardhats
- d) Safety shoes or boots
- e) Rubber overshoes or overboots
- f) Full and/or half face respirator with dual high efficiency organic vapor, acid gas and particulate filters; self-contained breathing apparatus or other supplied air system as necessary to conduct remedial action in a safe manner.

Protective equipment usage procedures shall be developed by the Contractor. These requirements shall contain, but not be limited to, the following:

- 1) All prescription eyeglasses in use on the site shall be safety glasses.
- 2) Respirator filters shall be changed daily or upon breakthrough, whichever occurs first.
- 3) Coveralls and gloves shall be tightly secured to other clothing (by tape, for example) to minimize worker exposure to contaminants.
- 4) All disposable or reusable gloves worn on the site shall be approved by the Safety Officer. Inner gloves shall be disposable latex.
- 5) Footwear used on-site shall be steel-toed safety shoes or boots, with chemical resistant soles, and shall be covered by rubber overshoes when entering or working in the "Dirty" Area or Decontamination Zone.

- 6) All on-site personnel shall wear an approved hardhat when present in the "Dirty" Area.
- 7) All personal protective equipment worn on-site shall be decontaminated at the end of the work day. The Safety Officer will be responsible for ensuring all personal protective equipment is decontaminated before being reissued.

Ps.12.13 RESPIRATORY PROTECTION

The Contractor shall monitor, evaluate, and provide respiratory protection for all on-site personnel.

The Contractor shall develop and submit a respiratory protection program for approval to the Engineer prior to commencing on-site work. As a minimum, the Contractor's respiratory protection program shall conform to the Velsicol Chemical Corporation guidelines contained within Appendix A.

The Safety Officer shall be responsible for implementing, maintaining and enforcing the respirator program.

The ability for on-site personnel to wear respirator protection shall be guaranteed by the Contractor. Cardiopulmonary system examination and pulmonary function testing are minimum requirements.

On-site personnel unable to pass a respiratory fit test shall not enter or work in the "Dirty" Area or Decontamination Zone.

Ps.12.14 PERSONAL HYGIENE

The Contractor shall be responsible for, and ensure that all personnel performing or supervising remedial work within a potentially contaminated work area, or exposed or subject to exposure to hazardous chemical vapors, liquids, or contaminated solids, observe and adhere to the personal hygiene-related provisions of this section.

On-site personnel found to be disregarding the personal hygiene-related provisions of this plan shall, at the request of the OSC, the Engineer, or site Safety Officer, be barred from the site.

The Contractor shall provide, as a minimum, the following for the personal hygiene of all on-site personnel.

- a) Suitable disposable outerwear, gloves, hardhat liners, and footwear on a daily basis for the use of on-site personnel and visitors.
- b) Contained storage and disposal for used disposable outerwear.
- c) A lunch and/or break room.
- d) A smoking area.

The Contractor shall also include and enforce the following provisions:

- i) On-site personnel shall wear disposable outerwear, gloves, and outer footwear at all times whenever entering or working in the "Dirty" Area or Decontamination Zone.
- ii) Used disposable outerwear shall not be reused, and when removed, shall be placed inside disposable containers provided for that purpose.
- iii) Smoking shall be prohibited except in a designated smoking area.
- iv) Eating and drinking shall be prohibited except in a designated lunch or break area.
- v) Soiled disposable outerwear shall be removed prior to entering the lunch area, and prior to cleansing hands.
- vi) On-site personnel shall thoroughly cleanse their hands and other exposed areas before entering the smoking or lunch area.
- vii) All personnel working in the "Dirty" Area or Decontamination Zone shall shower and change to fresh clothing after each working period or shift, prior to leaving the site.
- viii) Used work clothing shall be laundered daily in a facility provided by the Contractor within the decontamination zone. Wash water shall be disposed of on-site as directed by the Engineer.

The Owner shall supply the hygiene facility which shall provide the following:

- a) Shower facilities for all on-site personnel.
- b) Hand washing facilities.
- c) An area for changing into and out of and storing work clothing separate from street clothing.

Ps.12.15 AIR MONITORING

During active phases of work under this Contract, the Owner shall perform boundary particulate air monitoring at six locations adjacent to the Plant Site. The results of such monitoring shall be utilized to evaluate and modify the Contractor's particulate emission control program, described in Section Ps12.16. Velsicol shall monitor excavation and spoils areas on a periodic basis by Draeger tube for the following compounds;

- i) Benzene
- ii) Carbon tetrachloride
- iii) Phenol
- iv) Chloroform
- v) 1,2-Dichloroethane

In addition, Velsicol Chemical Corporation shall maintain a continuous recording of windspeed, and wind direction at one location adjacent to the Plant Site.

During the progress of active remedial work, the Contractor shall monitor the quality of the air in and around each active work location. Sampling shall be conducted on a regular periodic basis, and additionally as required by special or work-related conditions. The Contractor by downwind air sampling shall monitor air leaving the active work locations. Air sampling shall be conducted for gases, particulates and vapors. Any departures from general background shall be reported to the Engineer who will in conjunction with the Safety Officer and the OSC determine when operations should be shut down and restarted.

Instruments required, and provided by the Contractor for air monitoring shall include an organic vapor photoionizer and personal dust monitors. Velsicol shall make available to the Contractor a two station organic vapor analyzer in good operating order for explosivity/flammability monitoring. Operation, maintenance, and post-construction overhaul shall be the responsibility and cost of the Contractor; however for training purposes the Engineer shall have on-site personnel experienced in the operation and maintenance of this equipment. Copies of the organic vapor analyzer print-out shall be provided daily to the Engineer.

Contractor air monitoring equipment shall be operated by personnel trained in the use of the specific equipment provided and shall be under the control of the site Safety Officer. A log of the location, time, type, and value of each reading and/or sampling shall be maintained. Copies of daily log sheets shall be included in a daily report to the Engineer.

Should the organic vapor level in any active working location exceed 100 ppm for any single reading, or 50 ppm for any two successive readings, or should the explosimeter indicate in excess of 20 percent of the lower explosive limit on any single reading, then that work location shall be shut down and evacuated upwind. Work shall not resume at such a work location until authorized by the OSC, the Engineer, and/or site Safety Officer.

The Contractor shall be responsible for appropriate respiratory protection during all work activities. As a minimum, the Contractor shall ensure that all personnel working within or adjacent to an active work location are supplied with and use half face respiratory protection.

A wind direction indicator shall be installed by the Contractor at each active work location.

Ps. 12.16 CONTAMINANT MIGRATION CONTROL

All vehicles and equipment used in the contaminated areas shall be decontaminated to the satisfaction of the Engineer and Owner prior to being removed from site.

A decontamination wash facility with limited storage capacity for wash waters exists near the North Street entrance to the site. All potentially contaminated equipment and vehicles shall be decontaminated at this facility, prior to leaving the site.

The Contractor shall provide sufficient cleaning units to provide efficient hot water high pressure cleaning of equipment.

Wash waters shall be removed by the Contractor from the decontamination facility holding basin tank on an as required basis and transported and discharged to the on-site holding tank located in the northwest sector of the site. Final disposal of wash waters shall be the responsibility of the Owner.

Personnel engaged in vehicle decontamination shall wear protective equipment including disposable clothing and respiratory protection.

Ps.12.17 PARTICULATE EMISSION CONTROL

Prior to commencing work, the Contractor shall submit to the Engineer for approval, a fugitive particulate emission control program. During remedial action, the Contractor shall implement and enforce this program to minimize the generation and off-site migration of fugitive particulate emissions.

All roadways, designated work areas and other possible sources of dust generation shall be controlled by application of water or calcium chloride solution, as directed by the Engineer.

Personnel respirable dust monitors shall be utilized to monitor the on-site levels of dust generation. Departures from general background shall be reported to the Engineer who shall initiate the appropriate action including work stoppage to reduce dust emissions to an acceptable level.

Ps.12.18 POSTED REGULATIONS

The Contractor shall post signs at the site entrance and on the perimeter of the "Dirty" Area which state "Warning, Hazardous Work Area, Do Not Enter Unless Authorized". In addition, a notice directing visitors to the Security Officer shall be posted at the site entrance.

Safety regulations and safety reminders shall be posted at conspicuous locations throughout the site. All regulations shall be approved by the Owner and the Engineer prior to being posted.

Ps.12.19 SAFETY MEETINGS

The Safety Officer shall conduct weekly safety meetings which shall be mandatory for all site personnel. The meetings shall provide

refresher courses for existing equipment and protocols, and shall examine new site conditions as they are encountered.

Additional safety meetings shall be held on an as needed basis.

Should any unforeseen or site peculiar safety related factor, hazard, or condition become evident during the performance of work at this site, it shall be the Contractor's responsibility to bring such to the attention of the Engineer and Owner in writing as quickly as possible, for resolution. In the interim, the Contractor shall take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

Ps.13 **TEMPORARY FACILITIES**

Ps.13.01 **GENERAL**

The Contractor shall furnish the temporary structures and facilities detailed herein, at locations approved by the Engineer and Owner. All structures installed under this section shall be removed by the Contractor at the completion of the Project.

The Contractor shall provide temporary on-site facilities for the following:

- a) Emergency Medical Facility
- b) Equipment Storage
- c) Personnel hygiene

Floor plans, proposed fixtures, materials of construction and proposed siting locations shall be submitted to, and receive approval from the Engineer prior to erection of facilities at the site.

All areas specified herein shall be located within the "Clean" Area with the exception of the emergency medical, and personnel decontamination facilities which shall be located within, and straddle, both the "Clean" and "Dirty" Areas.

Ps.13.02 **EMERGENCY FIRST AID FACILITY**

The Contractor shall provide an emergency first aid facility. This facility shall be adjacent to and connect with the personnel decontamination facility. The structure shall contain the following equipment and supplies:

- a) Stretcher;
- b) One set of crutches;
- c) Two self contained air respiratory devices;
- d) One counter and sink with running potable water;
- e) One Cot;
- f) Blankets and towels as required;
- g) First aid medications appropriate for the initial treatment of burns, abrasions, fractures, and ingestion or dermal contact with on-site hazardous waste;

Ps.13.03 **PERSONAL HYGIENE FACILITY**

The Owner shall provide a personnel hygiene trailer containing:

- a) Shower facilities with at least one shower for every six (6) on-site personnel;
- b) locker room with one locker for each on-site personnel;
- c) laundry area equipped with automatic washing and drying machines;
- d) toilet facilities with at least one toilet and hand basin for every six (6) on-site personnel.

The contractor shall also supply the following facilities:

- a) A room where on-site personnel can eat;
- b) A room where all personnel safety equipment and protective clothing can be stored;
- c) Boot washing facility and boot rack for washed boots to drain;
- d) Sanitary waste and wash water waste holding tanks and piping from Personnel Hygiene Facility. The sanitary waste holding tank may be omitted if a direct connection to the City sewer system is permitted.

The Contractor shall maintain and supply all facilities in a clean condition. Drain water from all washing facilities shall be conveyed to a temporary Contractor supplied and installed on-site holding tank. These wash waters shall be collected and transported to the on-site holding tank by the Contractor on a daily basis or more frequently if need should arise. Final disposal of wash waters shall be the responsibility of the Owner. Sanitary waste from toilets shall be conveyed to a separate holding tank which shall be emptied on a periodic basis and discharged to the municipal sewerage system. Alternatively, sanitary facilities may be discharged directly to the City sewer system if approval of the City is acquired by the Contractor.

Ps.13.04 EQUIPMENT STORAGE

A partitioned equipment storage area shall be provided and shall have access through a lockable door. Sufficient shelving shall be installed for storage and inventory control of small items. In addition, this area shall contain one four drawer lockable filing cabinet and a wooden lockable locker sufficient for the storage of surveying and testing instruments. Keys for the storage area shall be distributed by the Contractor to personnel approved by the Owner and Engineer.

Ps.14 MISCELLANEOUS

Ps.14.01 EXCAVATE AND DISPOSE OF DEBRIS

Excavation of the internal groundwater collection system interceptor trench will be through identified areas of concrete structures and subsurface piping. Prior to installation of the subdrain piping, the Contractor shall remove all concrete and piping, cut both into manageable pieces and dispose on-site as designated by the Engineer. All subsurface piping shall be removed 5 feet beyond each side of the trench excavation and plugged with concrete as specified in Section Ps.9.11. No salvage of pipe or materials will be allowed.

Ps.14.02 COVER DISPOSED SPOILS

All spoils disposed of on-site as directed by the Engineer shall be covered with a minimum of 12 inches of clean fill from the project borrow pit. The cover material shall be placed in 6 inch lifts and shall be compacted to 90% Standard Proctor Density.

Ps.14.03 ROAD CONSTRUCTION

a) General

This work shall consist of the alteration of existing roadways including granular materials, grading, and compaction.

b) Material

Granular for road base and driveway restoration shall conform to Michigan Department of Transport Specifications for Michigan Series 23 Class A dense graded aggregate.

Calcium chloride shall be in liquid solution containing no less than 30% Calcium chloride by weight.

c) Construction

i) Granular Road Base

Granular road base shall be placed in lifts not exceeding six inches, and compacted to a minimum of 95% Standard Proctor Density.

During all road construction the Contractor shall sign and maintain all safety signs for the duration of the road construction. Safety signs shall be placed at all approaches to the area of construction.

ii) Culverts

Culverts as required shall be placed to the lines and grades directed by the Engineer.

Bedding shall be as approved by the Engineer and shall extend to a depth of six inches below and above the pipe. Bedding and backfill shall be compacted to a minimum of 95% Standard Proctor Density.

iii) Calcium Chloride

Following completion of fine grading operations, the Contractor shall apply calcium chloride and thoroughly compact the road surface.

Ps.14.04 REGRADE DITCHES

The Contractor shall regrade the ditch running east-west across the temporary easement in the back yards of the Watson Street homes. The ditch line shall be redefined such that it breaks at its high point in an easterly and westerly direction at the easterly boundary of the temporary construction easement.

Ps.14.05 SUPPLY TANKER TRUCK

The Contractor shall supply a mechanically sound tanker truck of sufficient capacity to facilitate removal of accumulated wash waters from the decontamination areas to the Plant Site holding tank. All valves, piping, pumps and other equipment shall be water tight to prevent leakage of collected leachate.

The Contractor shall make all provisions necessary to ensure proper access for the tanker truck to all points of collection and disposal.

The tanker truck shall be thoroughly decontaminated following each use if not exclusively dedicated to this project.

Ps.14.06 CONSTRUCT SEDIMENTATION CONTROL STRUCTURES

Sedimentation control structures shall be installed and maintained along the Pine River embankment as directed and approved by the Engineer. In general, a 6 inch thick mat of hay or straw shall be placed and staked along the entire river side perimeter, 10 feet from the top of the embankment. At each off-take ditch outlet, weirs consisting of rectangular bales of straw and pea gravel shall be constructed and maintained throughout the duration of the project as directed by the Engineer.

Ps.14.07 EXCAVATE, LOAD, TRANSPORT AND COMPACT CLAY FILL OVER SPOILS

All material which is deemed to be unsuitable for use as backfill shall be disposed of on-site in areas designated by the Engineer.

Prior to the end of each working shift all disposed spoils shall be covered with 12 inches of clean fill material, obtained from the project borrow pit, and compacted to 90% Standard Proctor Density placed in 6 inch maximum lifts.

Ps.14.08 PROVIDE MECHANICAL ROAD SWEEPER

The Contractor shall supply a mechanically sound road sweeper capable of removing loose particulate matter from asphalt roadways.

The sweeper shall be capable of collecting and retaining all sweepings with a minimum of dust.

The sweeper shall be fitted with a misting attachment capable of spraying a fine mist of water over areas to be swept. All sweepings shall be disposed of on-site in areas designated by the Engineer.

Ps. 15 PROJECT CLOSEOUT

Ps. 15.01 DECONTAMINATION

All equipment and materials shall be thoroughly decontaminated prior to removal from site.

Decontamination shall take place within the designated equipment decontamination facility and shall consist of degreasing (if required) followed by high pressure, hot water cleaning supplemented by detergents or solvents as appropriate. Special attention shall be paid to removal of material on and within the tracks and sprockets of crawler equipment, and the tires and axles of trucks and rubber tire mounted equipment.

The decontamination wash unit shall be portable high pressure with self contained water storage tankage and pressurizing system. Each unit shall be capable of heating wash waters to 180°F and providing a nozzle pressure of 150 psi.

Prior to removal from site, all decontaminated equipment and materials shall be inspected by the Engineer. The Engineer shall have sole authority to approve decontamination as complete.

Ps. 15.02 FINAL CLEAN-UP

The Contractor shall remove all equipment and materials from site at the completion of the Project.

The Contractor shall remove and dispose of all debris to the satisfaction of the Engineer.

All access or haul roads shall be regraded to prevent ponding of water to the satisfaction of the Engineer.

METHOD OF PAYMENT

Mp.1

GENERAL

The Form of Bid and Additional Unit Prices are to be used as a basis of payment only and shall not be used as a description of the full extent of the work required to be performed under this Contract. All work specified on the Contract Drawings and in the Specifications must be included in the appropriate items in the Form of Bid. The method of payment for each of the bid items will be as outlined in this section. Items not specifically listed in the Form of Bid or outlined in the Method of Payment shall be included in the appropriate Unit Prices for full and complete performance of the work.

Mp.2 **PROJECT START-UP**

Mp.2.01 **MOBILIZATION**

1. Payment for mobilization will be made at the lump sum bid stipulated in the Form of Bid for Item A-1 which price and payment shall be full compensation for movement of all equipment and materials to the site of work, including all necessary permits; supply and installation of Contractor required facilities including buildings, storage areas and trailers; supply and installation of Contractor required services including telephone, power, water and sanitary facilities; furnishing and constructing the slurry mixing plant; constructing the hydration ponds; delivery and storing bentonite on-site; providing a suitable water supply; and all other activities or costs associated with project start-up not paid for under other Items.

Mp.2.02 **MEDICAL SURVEILLANCE**

1. Measurement for medical examinations will be made at the actual number of on-site personnel, not to exceed 20, who have received Baseline and Exit medical examinations in accordance with the approved medical surveillance protocol established in accordance with Section Ps.12.04 is determined by the Owner.
2. Payment for the quantity determined above will be made at the unit price per person bid in the Form of Bid for Item A-2 which price and payment shall be full compensation for providing Baseline and Exit medical examinations in accordance with established protocol for up to 20 personnel. The Contractor shall include in these personnel 5 non-Contractor personnel. Medical examinations for Contractor personnel exceeding 15 will be at the Contractor's expense, unless otherwise approved by the Owner in writing. Interim medical examinations required because of on-site accidents or other causes resulting from Contractor's operations shall be at the Contractor's expense.

Mp.2.03 **INSURANCE & BONDS**

1. Payment for insurance and bonds, will be made up to the value of the lump sum bid in the Form of Bid for Item A-3 which price and payment shall be full compensation for furnishing all insurance and bonds, required of in these Contract Documents and as required by all Federal, State and local agencies having jurisdiction over this work. Payment will be made on the basis of documentation in the form of receipted invoices provided to the Engineer.

Mp.3 **CONSTRUCT STORM SEWER**

Mp.3.01 **PIPE INSTALLATION**

1. Measurement for installation of concrete storm sewer pipe will be made at the actual number of lineal feet installed field measured by the Engineer horizontally between the centers of consecutive manholes.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Items B-1 through B-11 which price and payment shall be full compensation for furnishing and installing all sewer pipe as specified; performing quality control testing during construction to maintain line and grade; supply and placing of backfill and bedding; excavation and removal of existing CMP pipe crossing under Watson Street as shown on the Contract Drawings; disposal of spoils on site as directed by the Engineer; connecting new storm sewer line to existing sewer line; performing final flushing and cleaning prior to "end of maintenance inspection"; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.3.02 **DITCH INTERCEPTORS**

1. Payment for construction of the ditch interceptors will be made for each interceptor installed as bid in the Form of Bid for Item B-12 which price and payment shall be full compensation for furnishing and installing the proposed ditch interceptors between the storm sewer line and revise the ditch line as shown on the Contract Drawings.

Mp.3.03 **MANHOLES AND CATCHBASINS**

1. Measurement for construction of the manholes and catchbasins along the line of the storm sewer will be made at the actual number of vertical feet installed as field measured by the Engineer vertically from the lowest invert in the manhole or catchbasin to the final elevation of the top of the manhole or catchbasin cover.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Items B-13 through B-22 which price and payment shall be full compensation for furnishing and constructing proper granular bases and concrete bases; supplying and installing proper cast iron frames and lids and bricking frames to final grades; supply and placement of backfill as specified; construction of benching at the base of manholes; flushing and cleaning each manhole and catchbasin prior to "end of maintenance inspection"; disposal of spoils on site as directed by the Engineer; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.3.04 HEADWALL

1. Payment for construction of the headwall at the storm sewer outlet into the Pine River will be made at the lump sum price bid in the Form of Bid for Item B-23 which price and payment shall be full compensation for furnishing, forming and constructing the headwall as shown on the Contract drawings; final grading and sodding of the slope along the outfall of the headwall above the rip rap; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.3.05 RIP RAP

1. Measurement for rip rap will be made in square yards at the actual number of square yards of rip rap placed at the headwall outfall determined by field measurements.
2. Payment for the quantity determined above will be made at the unit price per square yard bid in the Form of Bid for Item B-24 which price and payment shall be full compensation for furnishing, hauling and machine placing rip rap to a depth of 12 inches as directed by the Engineer.

Mp.3.06 DEWATERING

1. Payment will be made at the lump sum bid in the Form of Bid for Item B-25 which price and payment shall be full compensation for all labor, materials and equipment required to provide a suitable means of maintaining a dry work area during the installation of the storm sewer; maintaining the base of the trench excavation to prevent softening of the floor or the formation of a "quick" condition during construction; disposal of all collected water in the on site holding tank; and all other miscellaneous items for which separate payment is not provided for under other Items.

Mp.4 UPGRADIENT CONTAINMENT WALL CONSTRUCTION

Mp.4.01 EXCAVATE WORKING PLATFORM

1. Measurement for the excavation for the working platform will be made in cubic yards of the lesser of actual or theoretical quantity as derived from cross-sections taken prior to and subsequent to the excavation. Volumes will be calculated using the average end area method.
2. Payment for the quantity as determined above will be made at the unit price per cubic yard bid in the Form of Bid for Item C-1, which price and payment will be full compensation for excavation to accommodate the level working platform to lines and grades as detailed in the Contract Drawings or as directed by the Engineer, and to dispose of all spoils on-site in areas as directed by the Engineer.
3. Payment for covering the disposal areas will be made at the unit price bid in the Form of Bid for Item G-4.

Mp.4.02 CONSTRUCT WORKING PLATFORM

1. Measurement for construction of working platform will be made in bank cubic yards of clay material determined from cross-sections of the clay borrow pit taken prior to and subsequent to excavation. Volumes will be computed by the average end area method.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item C-2, which price and payment will be full compensation for excavating, loading, transporting and placing the clay to a density not less than 98% modified proctor.

Mp.4.03 CONTROL BERM

1. Measurement for the construction of control berms will be made in bank cubic yards of clay material determined from cross-sections of the clay borrow pit taken prior to and subsequent to excavation. Volumes will be computed using the average end area method.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item C-3, which price and payment will be compensation in full for excavating, loading, transporting, placing and compacting clay to a density of 90% Standard Proctor to construct clay control berms to lines and grades as detailed in the Contract Drawings. Payment shall also include the removal and spreading of the berms subsequent to construction of the upgradient containment wall.

Mp.4.04 CONSTRUCT UPGRADIENT WALL

1. Measurement for construction of the upgradient wall along the perimeter of the Plant Site will be made in square feet at the actual number of square feet constructed determined by multiplying the length of wall installed by the vertical distance measured from the base of the containment wall to the top of the working platform, measured along the centreline of the trench excavation at 25' intervals as determined by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per square feet bid in the Form of Bid for Item C-4, which price and payment shall be full compensation for furnishing, placing and constructing the upgradient containment wall as detailed on the Contract Drawings including maintenance of the existing plant boundary chain link fence for the duration of the Contract; protection of mixed slurry should temperatures drop below 35°F; overexcavation; disposal of all excess slurry at the completion of construction; excavate, transport and compact clay cap over completed containment wall to 90% Standard Proctor Density; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.4.05 BORROW MATERIAL

1. Measurement for imported fill material will be made in bank cubic yards determined from field cross-sections of the clay borrow pit prior to and subsequent to clay excavation and delivered to the Plant Site for use as backfill mix for the containment wall as directed by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per bank cubic yards bid in the Form of Bid for Item C-5, which price and payment shall be full compensation for excavating, transporting and mixing the imported backfill with the bentonite slurry; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.4.06 QUALITY CONTROL TESTING

1. Payment for the supply of Quality Control Testing by the Contractor will be made at the lump sum price bid in the Form of Bid for Item C-6 which price and payment shall be full compensation for furnishing and implementing a Quality Control Testing program to monitor the quality of all construction materials and practices, using the sampling methods specified in Section Ps.7.04.

Mp.5 INTERNAL GROUNDWATER COLLECTION SYSTEM

Mp.5.01 PIPE INSTALLATION

1. Measurement for construction of the internal groundwater collection system will be made in lineal feet at the actual number of lineal feet of pipe installed as directed and measured by the Engineer.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Items D-1 and D-2 which price and payment will be full compensation for supply of equipment, labor and materials required to excavate the subdrain trench to the grades shown on the Contract Drawings; lay the 4 inch diameter perforated clay pipe; backfill trench with granular filter material; dispose of trench spoils on the Plant Site; perform quality control testing during pipe installation; and all other miscellaneous items for which separate payment is not provided under other Items. No extra compensation will be considered for the removal of, or holdup caused by, debris encountered during the excavation of the collection system.
3. Payment for covering disposed trench spoils at the Plant Site with clay fill will be made under Item G-4.

Mp.5.02 GRANULAR SUMPS

1. Payment for construction of the granular sumps will be made for each sump constructed as bid in the Form of Bid for Item D-3 which price and payment shall be full compensation for excavating the sumps at the upgradient end of the interceptor lines; backfilling with an approved granular filter material; and all other items for which payment is not provided under other Items.
2. Payment for the disposal of excavated spoils on the Plant Site and covering with clay fill will be made under Item G-4.

Mp.5.03 DEWATERING

1. Payment for dewatering of the collection system excavation will be made at the lump sum price bid in the Form of Bid for Item C-4, which price and payment shall be full compensation for labor, materials and equipment required to provide a suitable means of maintaining a dry work area during the installation of the collection system; maintaining the base of the excavation to prevent a quick condition; disposal of collected water in the on site holding tank; and all other items and services for which payment is not provided under other Items.

Mp.6 FINAL COVER

Mp.6.01 GAS VENTS

1. Measurement for gas vents will be made at the actual number of prefabricated gas vent installed as located in the field.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item E-1 which price and payment shall be full compensation for supplying all labor, materials and equipment required to install the prefabricated gas vents as detailed on the Contract Drawings.
3. Supply of the prefabricated gas vent unit F.O.B. St. Louis, Michigan will be the responsibility of the Owner.

Mp.6.02 CLAY CAP

1. Measurement for clay cap construction will be made in cubic yards calculated by the average end area method from cross-sections of the borrow pit taken prior to and subsequent to excavation of clay material.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item E-2 which price and payment will be full compensation for supply of equipment, labor and materials required to excavate, transport and place clay material from the project borrow pit; compact clay in six inch lifts to a maximum density of 98% modified Proctor; management of the clay borrow pit including dewatering, construction and maintenance of haul roads and provision of any required utilities; clean up of spillage along haul roads due to Contractor's operations; reexcavation of clay cap to verify the depth of clay on the Plant Site; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.6.03 WATER

1. Measurement for supply of water for compaction of clay cap will be made in M. gallon determined by volume measurement of the tank truck.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item E-3 which price and payment will be full compensation for furnishing and spreading water as required and in quantities determined by the Engineer.

Mp.6.04 PROOF ROLL

1. Payment for proof rolling the entire Plant Site prior to construction of the clay cap will be made at the lump sum price bid in the Form of Bid for Item E-4, which price and payment will

be full compensation for supplying all labor, materials and equipment required to, compact the pre-existing Plant Site soils to 90% Standard Proctor Density prior to constructing the final clay cap; fill and compact any voids or areas of substantial settlement with imported fill; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.7. HEALTH AND SAFETY

Mp.7.01 SPECIFIED SITE PERSONNEL

1. Measurement for specified site personnel will be made in working days (Items F-1 and F-2) for the actual number of days worked as determined and authorized by the Engineer. A work day is defined as any working day of 8 hours or more duration.
2. Payment for specified site personnel will be made for the quantities determined above at the respective unit price per working day bid in the Form of Bid for Items F-1 and F-2 which price and payment will be full compensation for providing personnel, all salaries, wages, benefits, taxes, uniforms and all other miscellaneous items not paid for under other Items.

Mp.7.02 PERSONNEL HYGIENE FACILITY

1. Payment for the Personnel Hygiene Facility will be made at the lump sum price bid in the Form of Bid for Item F-3 which price and payment will be full compensation for installing, and maintaining the facility on-site complete as specified in Section Ps.13.03 including; furnishing and installing the sanitary sewer from the facility to City owned sanitary lines including excavation, backfilling and granular material; installation of wash water sewer to the collection and pumpage wet well including excavation, backfill, granular material and connection to the wet well; supplies of soap, towels and other personal hygiene materials; supply and laundering of site dedicated work clothes; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.7.03 LUNCH ROOM AND EQUIPMENT STORAGE

1. Payment for Lunch Room and Equipment Storage Area will be made at the lump sum price bid in the Form of Bid for Item F-4(a) which price and payment shall be full compensation for furnishing, installing, and maintaining the structure on-site complete as specified in Section Ps.13.03 and Ps.13.04 including all furnishings and equipment; supply and maintenance of shelving for inventory control; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp7.04 EMERGENCY FIRST AID FACILITY

1. Payment for Emergency First Aid Facility will be made at the lump sum price bid in the Form of Bid for Item F-4(b) which price and payment shall be full compensation for furnishing, installing, and maintaining the structure on-site complete as specified in Section Ps.13.02 including all furnishings and equipment, and supply and maintenance of all medical equipment and supplies.

Mp.7.05 PERSONAL SAFETY EQUIPMENT AND PROTECTIVE CLOTHING

1. Measurement for personal safety equipment and protective clothing will be made on a per person on-site basis at the actual number of on-site personnel issued safety equipment and protective clothing.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item F-5 which price and payment shall be full compensation for supplying on-site personnel with items in new condition in accordance with the Safety and Health Plan outlined in Section Ps.9; maintenance of equipment on a daily basis; replacement of disposable equipment, as required; replacement of contaminated equipment or clothing; maintenance of self contained air supplies; drumming and disposal of discarded equipment or clothing; and testing of equipment as directed by the Engineer.
3. Payment will be made for up to 20 Contractor's personnel. Clothing and equipment for additional Contractor's personnel will be at his own expense. Payment for Owner's and Engineer's personnel will be made on an as required basis as authorized by the Engineer.

Mp.7.06 SITE SECURITY

1. Measurement for on-site security will be made in working days for the actual number of days security is provided during working hours at active access gates to the Plant Site without regard to the number of individual security personnel employed.
2. Payment for site security will be made on a daily basis bid in the Form of Bid for Item F-6 which price and payment shall be full compensation for furnishing and maintaining security at the two access gates to the Plant Site at such times the gates are in service during working hours; maintaining sign-in, sign-out log for visitors and site personnel; posting and maintaining all required signs; limiting vehicular traffic on-site to authorized vehicles only; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.8 **MISCELLANEOUS**

Mp.8.01 **SURFICIAL SOIL EXCAVATION**

1. Measurements for excavation of soils between the upgradient containment wall and City owned roadways and within the temporary construction easement will be made in bank cubic yards determined from calculations made using average end area method from cross-sections of the excavated areas taken prior to and subsequent to excavation of the material.
2. Payment for the quantity determined above will be made at the unit price per bank cubic yards bid in the Form of Bid for Item G-1 which price and payment shall be full compensation for supply of all materials, equipment and labor to excavate load and transport the top one foot of surficial material between the upgradient wall and City owned roadways and within the temporary easement; removal of all vegetation from the excavation area; disposal of all spoils on the Plant Site in an area designated by the Engineer; and all other miscellaneous items for which separate payment is not provided under other Items.
3. Payment for covering of the excavated material will be made under Item G-4.

Mp.8.02 **IMPORTED BACKFILL**

1. Measurement for imported backfill will be made in bank cubic yards determined from cross-sections of the clay borrow pit prior to and subsequent to fill and topsoil excavation and delivery to the Plant Site for use as backfill for the excavation described in Mp.8.01. The excavation must have a final cover of six inches of topsoil.
2. Payment for the quantity determined above will be made at the unit price per bank cubic yard bid in the Form of Bid for Item G-2 which price and payment shall be full compensation for supply of all materials, equipment and labor required to excavate load and transport fill material and topsoil from the borrow pit to the Plant Site; placement and compaction of material in excavated areas; clean up any spillage of material along haul routes as a result of operations; and all other miscellaneous items for which payment is not provided under other Items.

Mp.8.03 **DISPOSAL OF DEBRIS**

1. Payment for disposal of concrete and steel debris will be made at the lump sum bid price in the Form of Bid for Item G-2, which price and payment shall be full compensation for excavation and removal of all debris from excavations; for cutting or breaking debris into manageable sizes; for transporting debris to the Plant Site disposal area; and all miscellaneous items for which separate payment is not provided under other Items.

Mp.8.04 COVER SPOILS

1. Measurement for covering disposed spoils will be made in bank cubic yards determined from cross-sections of the clay borrow pit prior to and subsequent to clay excavation and delivered to the Plant Site to cover all disposed spoils.
2. Payment for the quantity determined above will be made at the unit price per bank cubic yard bid in the Form of Bid for Item G-4 which price and payment shall be full compensation for supply of all materials, equipment and labor required to excavate, load and transport clay material to the Plant Site; cover disposed spoils with a minimum of 12 inches of material; compact clay cover in 6 inch lifts to 90% Standard Proctor Density; maintenance of clay pit and provision of any utilities required at the clay pit; and all other miscellaneous items for which payment is not provided under other Items.

Mp.8.05 SEED AND MULCH

1. Measurement for seed and mulch will be made in acres at the actual number of acres seed and mulched as determined in the field.
2. Payment for the quantity determined above will be made at the unit price per acre bid in the Form of Bid for Item G-5 which price and payment shall be full compensation for furnishing and seeding and mulching all disturbed lands privately owned or owned by the City of St. Louis.

Mp.8.06 REGRADE WATSON STREET

1. Measurement for regrading of Watson Street will be made in tons at the actual number of tons of granular material placed as determined by weigh tickets issued at the material source.
2. Payment for the quantity determined above will be made at the unit price per ton bid in the Form of Bid for Item G-6 which price and payment shall be full compensation for furnishing and placing approved granular material in 12 inch lifts; compacting material to 95% Standard Proctor Density; and all other miscellaneous items for which payment is not provided under other Items.

Mp. 8.07 REGRADE DRIVEWAY ENTRANCES

1. Measurement for regrading all driveway entrances with the construction area will be made in tons at the actual number of tons of granular material placed as determined by weigh tickets issued at the material source.

2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item G-7 which price and payment shall be full compensation for furnishing and placing approved granular material at all driveway accesses disturbed along the construction; installation of 12 inch diameter CMP pipe under all driveway ramps on Watson Street; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.8.08 REGRADE DITCHES

1. Payment for ditch regrading will be made at the lump sum price bid in the Form of Bid under Item G-8 which price and payment shall be full compensation for regrading all ditches flowing into the proposed storm sewer as shown on the Contract Drawings and specified by the Engineer.

Mp.8.09 CALCIUM CHLORIDE

1. Measurement for placing calcium chloride will be made in gallons at the actual number of gallons used as directed by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per gallon bid in the Form of Bid for Item G-9 which price and payment shall be full compensation to furnish and apply calcium chloride to granular traffic areas and on-site haul roads to reduce generation of dust.

Mp.8.10 ROAD SWEEPER

1. Measurement for a mechanical road sweeper will be made in hours at the actual number of hours spent sweeping City owned roadways adjacent to work activities to prevent the generation of dust.
2. Payment for the quantity determined above will be made at the unit price per hour bid in the Form of Bid for Item G-10 which price and payment shall be full compensation for furnishing a mechanical road sweeper as required to clean city roadways; and dispose of sweepings on the Plant Site as designated by the Engineer.

Mp.8.11 SEDIMENTATION CONTROL

1. Payment sedimentation control along the Pine River banks will be made at the lump sum bid price in the Form of Bid for Item G-11 which price and payment shall be full compensation for furnishing and installing a hay sedimentation control barrier along the entire river bank; securing the hay with metal spikes; and all other miscellaneous items for which separate payment is not provided under other Items.
2. Payment for maintaining the sedimentation control and/or replacing it when so ordered by the Engineer shall also be included under this section.

Mp.8.12 MAINTAIN, CLEAN, AND RESTORE CITY AND COUNTY OWNED HAUL ROUTES

1. Payment for maintaining, cleaning and restoring haul roads owned by the City of St. Louis or Gratiot County will be made at the lump sum price bid in the Form of Bid under Item G-12 which price and payment shall be full compensation for all regrading, resurfacing, shouldering, cleaning, and other items required to maintain haul roads to the satisfaction of the Engineer and Municipal and City officials including final restoration to a condition no worse than preexisting.

Mp.9 PROJECT CLOSEOUT

Mp.9.01 DECONTAMINATE EQUIPMENT

1. Payment for equipment decontamination will be made at the lump sum price bid stipulated in the Form of Bid for Item H-1 which price and payment shall be full compensation for decontamination of all equipment contacting site soils or groundwater prior to removal from site; collection of wash waters from the decontamination facility and transport to the on-site holding tank; supply of a high pressure hot water wash unit; collection of all sediments and residues from the decontamination facility and disposal of collected material on-site as directed by the Engineer; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.9.02 CLEANUP AND DEMOBILIZATION

1. Payment for final site cleanup and demobilization will be made at the lump sum price bid in the Form of Bid for Item H-2 which price and payment shall be full compensation for removal and disposal of all debris on-site; removal of all equipment and materials from site; and regrading of all access or haul roads to prevent ponding, all to the satisfaction of the Engineer.

APPENDIX A
VELSICOL CHEMICAL CORPORATION
GUIDELINES FOR AN ACCEPTABLE RESPIRATOR PROGRAM

February 21, 1980

VELSICOL CHEMICAL CORPORATION

ENVIRONMENTAL HEALTH AND HYGIENE DEPARTMENT

GUIDELINES FOR AN ACCEPTABLE RESPIRATOR PROGRAM

INTRODUCTORY STATEMENT REGARDING THE USE OF RESPIRATORS

Every consideration shall be given to the use of effective engineering controls to eliminate or reduce exposure to respiratory hazards to the point that respirators are not required. OSHA regulations specify that compliance with the permissible exposure limits of potentially hazardous substances may not be accomplished through the use of respirators except: 1) during the period necessary to install engineering controls; 2) in situations in which engineering controls are either not feasible or to an extent insufficient to reduce the airborne concentration of the potentially hazardous substance below the specified permissible exposure limit; and, 3) in emergency situations. In summary, approved respirators must be made available and used only when it is not possible or practical to affect or maintain engineering controls. If the use of a respirator is deemed necessary, it is essential that all OSHA regulations are complied with.

RESPIRATOR PROGRAM GUIDELINES

The following corporate guidelines satisfy, in part, the OSHA requirement for written operating procedures. For complete OSHA compliance, each facility must also document specific activities and procedures involving the use of respirators.

I. WRITTEN STANDARD OPERATING PROCEDURES GOVERNING THE SELECTION AND USE OF RESPIRATORS SHALL BE ESTABLISHED

Overall responsibility for documenting and administering the respirator program resides with the manager of the facility. This responsibility can be delegated to another person; the facility safety incumbent is recommended. The person selected to head the respirator program shall possess/obtain adequate knowledge in all aspects of respiratory protection. This administrator should coordinate respirator purchasing, maintenance, cleaning, and training. Development and implementation of facility respirator operating procedures are included in the duties of this person.

II. RESPIRATORS SHALL BE SELECTED ON THE BASIS OF THE HAZARDS TO WHICH THE WORKER IS EXPOSED

There are various types of respirators available with certain capabilities and limitations. These different types range from disposable dust masks to self-contained breathing units. Proper selection is based on the physical, chemical, and physiological properties of the air contaminant (Addendum A) and on the concentration likely to be encountered. The quality of fit and the nature of work being performed also affect the choice of

respirators since some manufacturers offer the same model in two or three sizes. This will help to fit most employees properly with one brand of respirator.

The Environmental Health and Hygiene Department will assist in the selection of respirators by providing relevant information on contaminant properties and evaluating existing hygiene information.

III. THE USER SHALL BE INSTRUCTED AND TRAINED IN THE PROPER USE OF RESPIRATORS AND THEIR LIMITATIONS

Respirators shall not be issued to individuals (including contractors/visitors) who have not received respirator training.

The extent and frequency of worker training depends primarily on the nature and extent of the hazard. As a minimum, both workers and supervisors shall be trained in basic respirator practices. Respirators are effective only when they are acceptable to the worker and worn by him/her. Because proper use depends especially upon the wearer's motivation, it is important that the need for the respirator be explained fully. The basic training program should include:

- a) Discussion of the nature of airborne contaminants against which the wearer should be protected.
- b) Explanation of why other means of control are not immediately feasible.
- c) A discussion of why the respirator is the proper one for the particular purpose. Canisters, chemical cartridges, and filters do not have the same capabilities. For example, gas and vapor removing respirators provide no protection against particulate contaminants unless specified on the canister or chemical cartridge label. Likewise, particulate removing respirators protect against non-volatile particles only and do not provide protection against gases and vapors. A self-contained breathing apparatus (SCBA) is the appropriate respirator for any emergency and/or oxygen deficient situation.
- d) Instruction on the respirator's limitations. It should be emphasized that because of the limited useful service life of vapor canisters and cartridges, they shall be replaced daily or after each use, or even more often if the wearer detects odor, taste, or irritation. Particulate filters may be used until breathing resistance increases to an "uncomfortable" level.
- e) Instruction in procedures for assuring the respirator is in proper working condition.
- f) Instruction in fitting (Addendum B) and training in actual use, including a test of the facepiece-to-face seal. Respirators shall not be worn when conditions prevent a satisfactory face

assigned respirator storage area.

- h) Insert new filters, cartridges, or canisters prior to use; make sure seal is tight.

VI. RESPIRATORS SHALL BE STORED IN A CONVENIENT, CLEAN, AND SANITARY LOCATION

Respirators placed at work stations and work areas for emergency use shall be stored in compartments built for this purpose, be quickly accessible at all times and be clearly marked. Manufacturer's instructions shall be closely followed for proper storage of gas masks and self-contained breathing apparatus. When not in use, routinely used respirators, such as dust respirators, shall be placed in plastic bags and stored in cabinets at convenient locations in the work area in order to protect against dust, sunlight, extreme temperatures, excessive moisture, or damaging chemicals.

VII. RESPIRATORS SHALL BE INSPECTED DURING CLEANING BY TRAINED PERSONNEL. RESPIRATORS FOR EMERGENCY USE, SUCH AS SELF-CONTAINED DEVICES, SHALL BE THOROUGHLY INSPECTED AT LEAST ONCE A MONTH AND AFTER EACH USE.

Personnel involved in respirator maintenance must be thoroughly trained. Substitution of parts from a different brand or type of respirator invalidates approval of the device. Therefore, they must be aware of the limitations and never try to replace components or make repairs and adjustments beyond the manufacturer's recommendations, unless they have been specially trained by the manufacturer.

All equipment shall be inspected before and after use. Emergency equipment shall be inspected at least monthly to assure that it is in satisfactory working condition. A record shall be kept of inspection dates for respirators for emergency use and findings tabulated. The general inspection check list should include:

- a) Tightness of connections.
- b) Condition of facepiece, straps, connecting tubes, and canisters.
- c) Condition of exhalation and inhalation valves. If the sides of the exhalation valve gap even slightly, a new valve shall replace old.
- d) Pliability and flexibility of rubber parts. Deteriorated rubber parts shall be replaced. Unused rubber parts should be worked, stretched, and manipulated with a massaging action during inspection.
- e) Condition of lenses of full facepiece respirator. Damaged lenses shall be replaced or respirator sent to the manufacturer.
- f) Check on the charge of compressed air cylinder of self-contained breathing apparatus. The cylinders shall be fully charged accord-

ing to the manufacturer's instructions.

g) Proper functioning of regulators and warning devices.

VIII. APPROPRIATE SURVEILLANCE OF WORK AREA CONDITIONS AND DEGREE OF EMPLOYEE EXPOSURE SHALL BE MAINTAINED

The Environmental Health and Hygiene Department will provide assistance in maintaining the necessary facility surveillance program. The facility manager is responsible for notifying the Environmental Health and Hygiene Department of any operational (including materials) changes which may affect potential employee exposure. This applies whether or not the original operation had required respirator use.

IX. THERE SHALL BE REGULAR INSPECTION AND EVALUATION TO DETERMINE THE CONTINUED EFFECTIVENESS OF THE PROGRAM

Each Velsicol facility will be required to submit a respirator usage chart annually in June (Addendum D). Any newly written respirator guidelines for a specific facility shall be included.

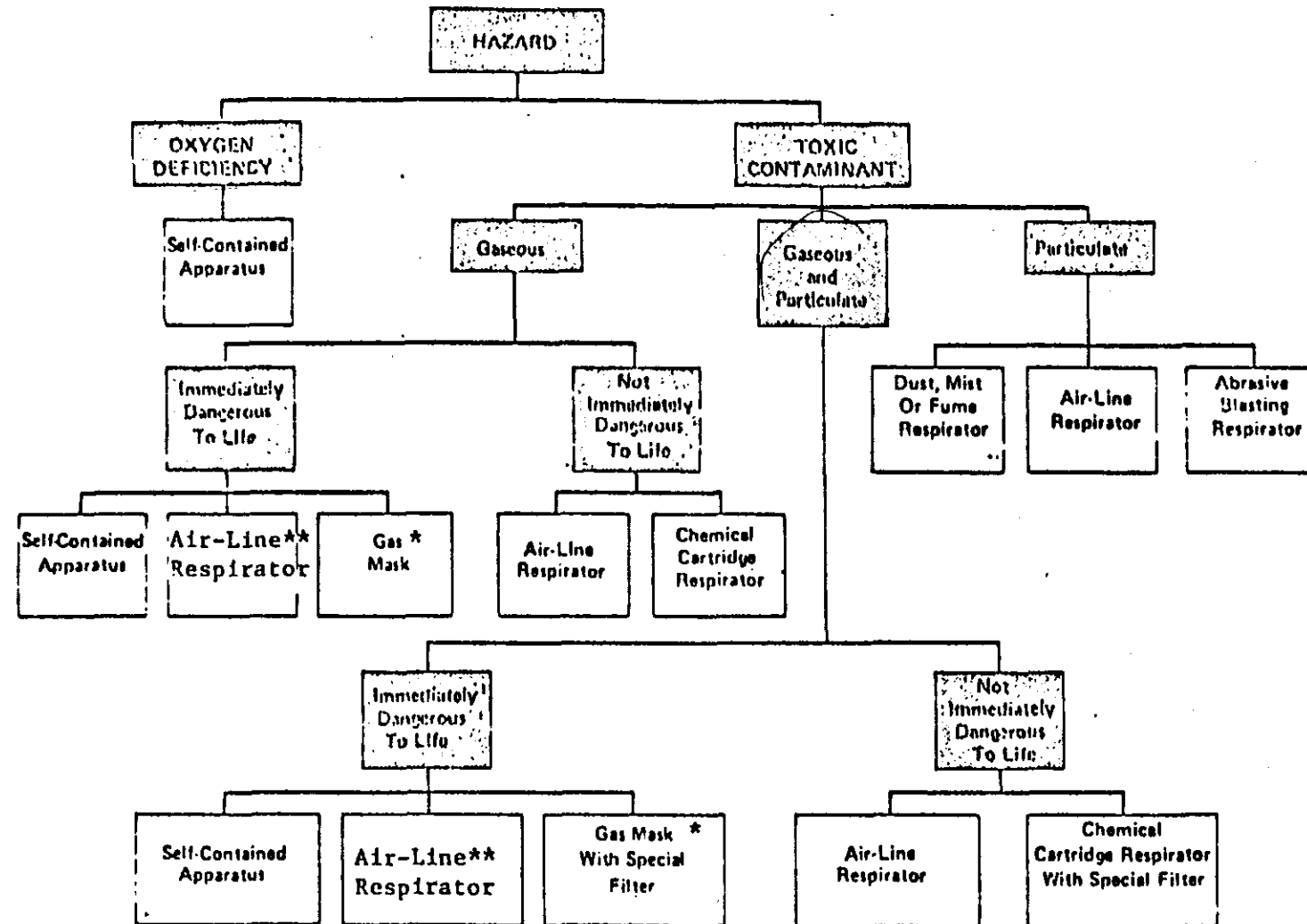
X. PERSONS SHALL NOT BE ASSIGNED TO TASKS REQUIRING USE OF RESPIRATORS UNLESS IT HAS BEEN DETERMINED THAT THEY ARE PHYSICALLY ABLE TO PERFORM THE WORK AND USE THE EQUIPMENT. THE LOCAL PHYSICIAN SHALL DETERMINE WHAT HEALTH AND PHYSICAL CONDITIONS ARE PERTINENT. THE RESPIRATOR USER'S MEDICAL STATUS SHALL BE REVIEWED PERIODICALLY.

XI. APPROVED OR ACCEPTED RESPIRATORS SHALL BE USED WHEN THEY ARE AVAILABLE. THE RESPIRATOR FURNISHED SHALL PROVIDE ADEQUATE RESPIRATORY PROTECTION AGAINST THE PARTICULAR HAZARD FOR WHICH IT WAS DESIGNED IN ACCORDANCE WITH STANDARDS ESTABLISHED BY COMPETENT AUTHORITIES.

At the present time, the National Institute for Occupational Safety and Health (NIOSH) has the sole responsibility for the approval of respirators used in any workplace other than mines. The Mine Safety and Health Administration (MSHA) approves those classes of respirators intended for use in mines.

Requirements for supplied breathing air quality are outlined in Addendum E. Air-line and self-contained breathing apparatus are the respirator types associated with compressed breathing air systems.

Addendum A
GUIDE TO SELECTION AND USE



* For emergency escape only

** With emergency escape bottle

Addendum B

RESPIRATOR FIT

An employee wearing a respirator can be protected against airborne contaminants only if there is successful sealing of the respirator on his or her face. All employees may not obtain a successful fit for a specific respirator, since facial dimensions vary considerably from person to person. A half facepiece must contact a rather complex facial surface and the possibility of leakage is greater than in the case of the full facepiece. Studies have shown that temples on glasses, absence of dentures, full beards, handlebar moustaches or wide sideburns can reduce respirator performance by as much as 25%.

The respirator facepiece-to-face seal shall be tested each time the employee enters a contaminated atmosphere. Most respirator manufacturers provide instructions for wearing and leak testing and these instructions shall be followed. Training programs shall annually cover these procedures. Facepiece-to-face fit tests include the following:

- A. Positive Pressure Test - Close or "block off" the exhalation valve and exhale gently into the facepiece. If a slight positive pressure is built up with no apparent outward leakage around the seal, then the facepiece-to-face seal is satisfactory. Note that this test only applies to those respirators which have an exhalation valve which can be blocked (the exhalation valve cover may have to be removed for the test).
- B. Negative Pressure Test - Close the inlet opening or hose of the respirator facepiece with the hand(s), tape or other means, inhale gently so that the facepiece collapses slightly and hold the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage occurs, then the facepiece-to-face seal is probably satisfactory.
- C. Isoamyl Acetate Test for Organic Vapor Cartridge Respirator, Canister Gas Mask or Air-Supplied Respirator - Wave a cotton swab soaked in isoamyl acetate⁽¹⁾ around the facepiece of the respirator. If the employee wearing the respirator detects the odor of isoamyl acetate, then the facepiece leaks. During the test, the employee should move and talk as he or she would during work.
- D. Visual Examination Test for Dust Respirator - Remove respirator and immediately examine the employee's face for traces of dust inside the seal area resulting from inward leakage from the environment. Note that this "after the fact" fit test is applicable to disposable dust respirators with or without exhalation valves.

(1) Isoamyl acetate can be obtained from a laboratory chemical supply firm.

If leakage is detected, the facepiece should be readjusted and the test repeated. If leakage is still noted, it can be concluded that this particular respirator will not provide an adequate seal for this employee. The employee should not continue to tighten the headband straps until they are uncomfortably tight simply to achieve an adequate facepiece-to-face seal. Different brands of respirators can be tested for "hard-to-fit" employees. A full facepiece respirator can be substituted for a half facepiece respirator. The only other alternative is to wear a respirator that provides positive pressure to the facepiece. Such respirators are powered air purifying respirators and air supplied respirators (continuous flow or pressure-demand). The powered air purifying respirator is battery operated and shall not be used in explosive atmospheres.

Employee surveillance shall be maintained by supervisory personnel to identify those facial conditions (hair, glasses, loss of dentures, etc.) which interfere with facepiece-to-face seal.

If the respirator does not fit properly and the condition cannot be corrected or eliminated, then the individual shall not be permitted to work in an area requiring routine or emergency use of respirators.

Addendum C

SUMMARY FOR RESPIRATOR USER

PURPOSE OF RESPIRATOR - Respirators are designed to provide respiratory protection against chemical vapors and particulates. The degree of protection is dependent upon the type of respirator, facepiece-to-face seal, condition of the respirator, and if the respirator is worn when required.

RESPIRATOR CAPABILITIES AND LIMITATIONS - Canisters, chemical cartridges and filters do not have the same capabilities. For example, gas and vapor removing respirators provide no protection against particulate contaminants unless specified on the canister or chemical cartridge label. Likewise, particulate removing respirators protect against non-volatile particulates only.

It should be emphasized that because of the limited useful time service of canisters and cartridges, they shall be replaced daily or after each use, or even more often if the user detects odor, taste, or irritation. Particulate removing respirators may be used until breathing resistance increases to an "uncomfortable" level.

RESPIRATOR FIT - The respirator facepiece-to-face seal shall be tested each time the user enters a contaminated atmosphere. Facepiece-to-face fit tests include the following:

1. Positive Pressure Test - Close or "block off" the exhalation valve and exhale gently into the facepiece. If a slight positive pressure is built up with no apparent outward leakage around the seal, then the facepiece-to-face seal is satisfactory.
2. Negative Pressure Test - Close the inlet opening or hose of the respirator facepiece with the hand(s), tape or other means, inhale gently so that the facepiece collapses slightly and hold the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage occurs, then the facepiece-to-face seal is probably satisfactory.
3. Visual Examination Test for Dust Respirators - Remove respirator and immediately examine the user's face for traces of dust inside the seal area resulting from inward leakage from the environment.

RESPIRATOR MAINTENANCE - Each respirator shall be washed with a detergent in warm water, rinsed, and dried. When a respirator is used by more than one individual, the respirator must also be disinfected after each use.

The following procedures are recommended for cleaning and disinfecting respirators:

1. Remove and discard any filters, cartridges or canisters.

2. Wash facepiece and breathing tube in detergent and warm water (120°F) or cleaner/disinfectant solution. Use a soft brush to facilitate removal of dirt. (For phosphate pesticide respirators, wash with an alkaline soap and rinse with a 50% alcohol (ethyl or isopropyl) solution).
3. Rinse completely in clean, warm water.
4. Air dry in clean area.
5. Clean out other parts as recommended by manufacturer.
6. Inspect valves, headstraps, and other parts and replace with new parts if defective.
7. Place in plastic bag or container for storage.
8. Insert new appropriate filters, cartridges, or canisters prior to use; make sure seal is tight.

(Addendum D)

RESPIRATOR USAGE CHART

<u>Facility</u>	<u>Date</u>					<u>Individual Completing Chart</u>
<u>Description of Specific Operation(s) where Respirators are Used/Employee Job Title</u>	<u>Frequency & Duration of Use</u>	<u>Contaminant(s)</u>	<u>RESPIRATOR</u>			<u>Number of Respirators Issued</u>
			<u>Type</u>	<u>Brand/Model No.</u>	<u>NIOSH/MSHA Approval No.</u>	
Connecting chlorine tank car/No. 1 Product operator	5 times/week 30 minutes/time	Chlorine	Full facepiece chemical cartridge	Acme/3101	TC-23C-77	3

The above is an example description of a respirator usage situation.

Addendum E

SUPPLIED BREATHING AIR QUALITY FOR RESPIRATORS

Breathing air shall be of high purity such that toxic compounds (particulate, vapor, or gas) are not present in sufficient concentration to threaten the health and safety of the user.

OSHA regulations, as a minimum, require that breathing air meet Grade D specifications as described and determined by analytical methods (or equivalent) in Compressed Gas Association (CGA) Commodity Specifications G-7.1-1973. Each facility utilizing compressed breathing air must have the equipment to determine carbon monoxide and oxygen content. A list of direct reading instruments for determination of oxygen and carbon monoxide concentrations is given in Appendix i, and applicable sampling procedures are given in Appendix ii. Manufacturers' instructions shall be followed for the calibration, use, and maintenance of these instruments. The specifications for Grade D breathing air are:

	<u>Grade D</u>
Carbon Monoxide	< 20 ppm
Carbon Dioxide	< 1000 ppm
Oxygen	19-23%
Oil Mist	< 5 mg/M ³
Odor	Free from pronounced odor

Although Grade D specifications allow measurable concentrations of carbon monoxide, any carbon monoxide above normal atmospheric levels indicates a "problem" with the compressed air supply equipment or procedures and should be investigated.

Breathing air may be supplied from cylinders, blowers, or compressors.

I. Breathing Air Cylinders

- A. Request suppliers to certify in writing that air purity meets CGA Commodity Specifications G-7.1-1973 for Grade D breathing air. Compressed breathing air cylinders shall be clearly labeled as such.

< - Less than
ppm - Parts of contaminant per million parts of air by volume
mg/M³ - Milligrams of contaminant per cubic meter of air

- B. Determine whether supplier compresses ambient air or manufactures synthetic air from nitrogen and oxygen. Check every compressed ambient air cylinder for carbon monoxide, and every synthetic air cylinder for oxygen since local suppliers may or may not comply with cylinder preparation or quality verification requirements of CGA Commodity Specification G-7.1-1973.
- C. Return to the supplier compressed breathing air found to have oxygen deficiency, carbon monoxide contamination, pronounced odor or distinct taste.

II. Breathing Air Blower Systems

Locate the hand-operated blower intake in an area free from air contaminants and upwind of potential sources of contamination.

III. Breathing Air Compressor Systems

A. Location

The compressor intake shall be located in a clearly identified area free from air contaminants. The facility supervisor shall be notified of non-routine activities (maintenance, contractors, etc.) which may affect the air quality of the breathing air compressor system.

The compressor shall not be operated near painting, large electric arcs, by-product gases from production processes, etc.

B. General Requirements

1. Install temperature rise alarm to indicate compressor malfunction resulting in overheating. Locate the sensor for the high temperature alarm at the outlet of the compressor before the storage chamber and set to activate at temperature specified by manufacturer. This is a precaution against exposure to toxic thermal decomposition products of the oil, lubricant, or lubricating device.
2. Use suitable in-line purifying sorbent beds and filters to assure breathing air quality. The purifier unit must be capable of removing all hazardous contaminants (particles, carbon monoxide, oil mist, etc.).
3. Inspect and maintain breathing air compressor systems. Check condition of friction rings, lubricant consumption, cooling jackets, purifier units, and other components in accordance with the manufacturer's instructions.

C. Type of Compressor

1. Use breathing air type (water or Teflon-lubricated)

compressor.

2. Do the following if an oil or synthetic-lubricated compressor must be used since thermal decomposition can produce carbon monoxide in the breathing air supply:
 - a. Use compressed air purifier designed to remove lubricant mist and carbon monoxide.
 - b. Test the compressed air for carbon monoxide at intervals of no less often than every 80 hours of operation. While continuous carbon monoxide alarms are available, their use is not recommended because of excessive calibration and maintenance requirements.

D. Source of Power

1. Use electric motors in preference to gasoline or diesel engines, since this source does not generate air contaminants.
2. Use diesel in preference to gasoline engines, since gasoline engines are more likely to produce significant quantities of carbon monoxide.
3. Equip engine with extensions for exhaust stack, crank-case vents and compressor intake and check carefully for exhaust manifold leakage.

IV. Multiple Purpose Plant Compressed Air Systems

The use of such systems for breathing purposes is not recommended because of difficulty in insuring against carbon monoxide production and inadvertent back pressuring of hazardous particles, liquids, gases, and vapors into the system. If multiple purpose plant compressed air must be used, follow all of the above guidelines for breathing air compressor systems.

In addition, check for oxygen, carbon monoxide, and hazardous particles, gases, and vapors before using the air-supplied respirators or for ventilating tanks prior to personnel entry.

APPENDIX B

BOREHOLE LOGS

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW-0
ELEVATION _____

DATE 5-8-52

PROJECT S. Lane
LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	2 FT. 6"	INS.	
G.W. ENCOUNTERED AT	FT.	INS.	
G.W. AFTER COMPLETION	FT.	INS.	
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>HEAVY</u>		

CREW CHIEF Sheol'sky HELPER D.J.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Penetration <small>Blows / 5"</small>
	0				
	1			<u>Very top soil black very moist</u>	
	2		<u>0'9"</u>	<u>SAND MED COARSE GRAY MOIST</u>	
	3				
	4				
	5				
	6				
	7				
	8		<u>7'0</u>	<u>Clay sand grey moist</u>	
	9				
	10				
	11				
	12				
	13		<u>12'0</u>	<u>Silty clay some sand grey very moist</u>	
	14		<u>13'0</u>	<u>EOB</u>	
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

State Michigan

Start Date May 20, 1982

Site Velsicol

Completion Date May 20, 1982

Boring No. UGW-1

Ground El. _____

Drilling Firm Michigan Testing

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 13.5'

Geologist Rodney T. Blase

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface			Commenced Drill 0955	
	1	Brown Clayey Sand, fine (SC)	5	Plastic Bag 1	3" O.D. Split Spoon 300 lb. Hammer	
	2	Tan Sand, Fine with trace of gravel (SP)	18		18" Drop 0.0-1.0 3/4" I.P. Hollow Sten Augers	
	3	Brown Clayey Sand, fine w/ trace of gravel	3		2" I.O. Split Spoon 2.0-3.0	
	4	Light Brown Sand, fine to medium with gravel (SP)	6		3" O.D. 3.0-4.0	
	5		3	2	2" I.O. 4.0-5.0	
	6		2	3	3" O.D. 5.0-6.0	
	7		1	4	2" I.O. 6.0-7.0 Hit Ground Water ~ 6.0'	
	8	Light Brown Sand, Fine to Coarse (SP) with trace of fine gravel	5	5	3" O.D. 7.0-8.0	
	9		10	6	2" I.O. 8.0-9.0	
	10	Gray Sand, Fine to Medium with trace of fine gravel (SP)	19	7	3" O.D. 9.0-10.0	

Composite Samples 10-100 (3 Jars)

State Michigan

Boring No. UGW-1

Site Velsicol

Page 2 of 2

lev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	10.4	Same as sample 7	22	8	2" I.D. 10.0-11.0	
	11	Gray Clay (CL) with trace of sand grains	61	9	3" O.D. 11.0-12.0 could not retrieve; sand in hole sample cleaned out with water	
	12	(Till)		11111		
	13		25	10		
	14				Bottom of Hole 13.5'	
					No sand seems encountered in 3.1' of clay till.	

50 cm
w/2" Spon
at 11-1

11/13/81

DRILLING LOG

Page 1 of 2

State Michigan

Start Date May 20, 1982

Site Velsical

Completion Date May 20, 1982

Boring No. UGW-2

Ground El. _____

Drilling Firm Michigan Testing

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Miller _____

Total Depth of Boring 16.5'

Geologist Rodney T. Bloss

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface			Commenced 1500	
				Plastic Bags		
	1	Dark Brown Sandy Silt w/ rootlets Light Brown sand, fine, with trace of fine gravel & fines (SP SM)	5	1	3" C.D. Split Spoon 0.0-1.0	
Composite sample 1.0-8.0	2	Tan sand, fine (SP)	4	2	~ 300 lb Hammer ~ 30" Drop	Augers
	3	with trace of gravel	4	3	3 1/4" I.D. Hollow Stem	
	4		4	4		
	5		3	5		
	6		6	6		
	7	Tan sand, fine to medium with trace of fine gravel (SP)	8	7	Becomes Moist 6.0-7.0	
	8		6	8	Hit Water 8.0'	
	9	Light Brown Sand, fine to coarse (SP)	6	9		
			4	10		

11/13/81

State Michigan

Boring No. UGW-2

Site Velsicol

Page 2 of 2

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Light Brown Sand, fine to coarse (SP)	10	11		
	12	Light Brown Sand, fine to medium (SP)	13	12		
	13		29	13	2" O.D. Split Spoon	
	14	Gray Clay with Sand (Till)	21	14		
	15		14	15	Small amount of sample recovered	
	16		47	16	.05' sand seam at 15.5' Gray fine	
	17				Bottom of Hole 16.5'	
					Backfilled with drill cuttings and 50 lbs of powdered bentonite	

11/13/81

DRILLING LOG

State Michigan

Start Date May 21, 1982

Site Velsicol

Completion Date _____

Boring No. UGW-3

Ground El. _____

Drilling Firm Michigan Testing

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 16.0

Geologist Rodney T. Bloese

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface		Plastic Bag	Commenced Drilling 0740	
	1	Light Brown Sandy Clay (CL) Brown Silty Clay with trace of sand (CC)	21	1	3" O.D. Split Spoon ~300 lb. Hammer ~30" Drop	
	2	Light Brown Sand, Fine with trace of fines (SP-S'm)	13	2	3 1/4" I.D. Hollow Stem Augers	
	3		4	3		
	4	Tan sand, Fine (SP)	4	4	Becomes Moist ~3.8'	
	5		5	5		
	6	Tan Sand, Fine to Medium with trace of fine gravel (SP)	4	6		
	7	Light Brown Sand, Fine to Medium with trace of fine gravel (SP)	4	7		
	8		8	8	Hit Groundwater ~7.5' 2" O.D. Split Spoon at 8-9' & ... small amount of sample recovered	
	9		8	9		
			5	10		

1.5 - 7.0
 3 Jars

State Michigan
 site Velsicol

Boring No. UGW-3

Page 2 of 2

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Light Brown Sand, Fine to Medium with trace of fine gravel (SP)	4	11	small amount of sample recovered 10-11'	
	12	Light Brown Sand, Fine to Medium (SP)	5	12		
	13		9	13		
	13 ¹²⁸	Brown Silty Clay with trace sand (CL)	26	14	Washed out boring RTS Photographed samples 14-15	
	14	Gray Silty Clay with trace of sand (CL) _H				
	15		39	15		
	16				Bottom of Hole 16.0'	
					Backfilled Boring with drill cuttings & 50 lbs. of powdered bentonite	

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW-25
ELEVATION _____

DATE 6-9-51

PROJECT _____
LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	5	FT. 9"	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	12	FT. 6	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	HEAVY		

CREW CHIEF Shelby HELPER D.J.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows/5"	Penetration
	0					
	1			Silty sand fine dark brown moist		
	2		1'9"	Silty sand fine brown moist		
	3					
	4					
	5					
	6					
	7					
	8					
	9		8'9"	Sand some coarse some stone brown wet		
	10					
	11					
	12		11'6"	Clayey sand grey moist		
	13		12'9"	Silty clay some sand grey moist		
	14					
	15		14'0"	Sandy clay some pebbles grey moist		
	16					
	17					
	18					
	19		18'0"	EOB		
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

State Michigan

Start Date May 21, 1982

Site Velsicol

Completion Date May 21, 1982

Boring No. UGW-4

Ground El. _____

Drilling Firm Michigan Testing

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 14.0

Geologist Rodney T. Blase

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
		Sand & Gravel (Fill)		Plastic Bag	Commenced Drilling 1010	
	1.2	Tan Fine Sand (SP)	5	1	3" O. D. Split Spoon -300 lb. Hammer ~30" Drop	
Composite Sample (10-70) 3 Jars (Chemical)	1.2	Brown Sand, Fine with Fines (SP)	4	2		Composite Bag 1.0-14.0
	2	Light Brown Sand, Fine with trace of gravel (SP)				
	3	Tan Sand, Fine (SP) with trace of fine gravel	3	3	3/4" I.D. Hollow Stem Auger	
	4		3	4		
	5		4	5	Becoming Moist 4.0	
	6		5	6		
	7		4	7		
	7	Light Brown Sand, Fine with trace of fine gravel (SP)	6	8	Hit Ground Water 7.0 2" O.D. Split Spoon	
	8	Light Brown Sand, Fine to Medium with trace of fine gravel (SP)	6			
9		9				

2" O.D. Split Spoon (Adjacent to Original Boring)

11/13/81

State Michigan
 site Velsicol

Boring No. UGW-4
 Page 2 of 2

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	10.6	Brown Sand, Fine to Medium	7		Photographed 10-11, 11-12,	Composite 10-14.0
	11	Gray Silty Clay with trace of Sand (CL)H	8			
	12	Sand partings 12.7-12.8'	9			
	13		9			
	14				Bottom of Hole 14.0	

11/13/81

DRILLING LOG

State Michigan

Start Date May 21, 1982

Site Velsicol

Completion Date May 21, 1982

Boring No. UGW-5

Ground El. _____

Drilling Firm Michigan Testing

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 14.0'

Geologist Rodney T. Bloese

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface			Commenced Drilling 1250	
	1	Sand & Gravel, Asphalt at Surface Brown clayey sand, fine (SC) with trace of fine gravel	12	1	3" O.D. Split Spoon ~300lb. Hammer ~30" Drop	
	2	Tan Sand, Fine (SP-SM) with trace of fine gravel	5	2	3 1/4" ID Hollow Stem Auger	
	3		6	3		
	4		5	4		
	5		5	5		
	6	Tan Sand, Fine to Medium with trace of fine gravel (SP)	4	6		
	7		3	7		
	8	Light Brown Sand, Medium to Fine with trace of fine gravel (SP)	2	8	Hit Ground Water ~7.5'	
	9		1	9	2" O.D. Split Spoon	
			11	10		

Composite (Chemical)
1.0-7.5'
3 Jars

11/13/81

State Michigan

Boring No. UGW-5

Site Velsicol

Page 2 of 2

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	10.7	Brown Sand, Medium to Fine with trace of fine gravel (SP)	4	11		
	11	Gray Silty Clay with trace of sand (CL)H	9	12		
	12		13	13		
	13		16	14		
	14					Bottom of Hole 4.0
					Boring backfilled with drill cuttings + 50 lbs of powdered bentonite	

11/13/81

State Michigan

Start Date May 21, 1982

Site Velsicol

Completion Date May 21, 1982

Boring No. UGW-6

Ground El. _____

Drilling Firm Michigan Testing

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 13.5'

Geologist Rodney T. Blosser

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface			plastic Bag	Commenced Drilling 1420
	1	Grey sand, gravel, & clay Light Brown Sand, Fine with trace of fine gravel (SP-5m)	4	1	3" O.D. Split Spoon ~300 lb. Hammer ~30" Drop	
	2		4	2		
	3	Tan Sand, Fine to Medium with trace of fine gravel (SP)	4	3		
	4		4	4		3 1/4" I.D. Hollow Stem Auger
	5		5	5		
	6		3	6		
	7	Light Brown Sand, Fine to Medium with trace of fine gravel (SP)	2	7	Hit Ground Water ~6.0'	
	8		2	8	2" O.D. Split Spoon	
	9		2	9	No sample recovered	
			3	10	No Sample Recovered	

Composite Chemical Sample 10-60 3 Jars

State Michigan
 Site Velsicol

Boring No. UGW-6

Page 2 of 2

Elev.	Depth	Description with trace of	Blow Count	Sample No.	Remarks	Well Const.
	10.3	Brown Sand, Medium to Fine fine gravel (SP)	5	9		
	11	Gray Silty Clay with trace of sand (CL)H	13	10	Photographed samples 9, 10+11	11.95-12.0
	12	fine gravel			.05 Gray fine sand	11.5-11.7
	13		32	11	.2' Gray fine sand .05 Gray fine sand	11.9-11.95
					Bottom of Hole 13.51	
					Backfilled boring with drill cuttings + 50 lbs of powdered bentonite	

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. UGU-6.

ELEVATION _____

DATE 6-8-32

PROJECT S. Mills

LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	6	FT.	T
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION		FT.	INS.
G.W. AFTER		HRS.	FT.
G.W. VOLUMES	None		

CREW CHIEF Shestsky HELPER D.J.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 5"	Penetration
	0				
	1			Silty sand black moist	
	2		0'9	Sand fine brown moist	
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10		9'9	Sand med coarse brown wet	
	11		11'0	Sandy clay grey moist	
	12				
	13				
	14		13'6	EOB	
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED.U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

State MICHIGAN
 Site VELSICOL
 Boring No. 06W 7
 Drilling Firm M.I.E
 Type of Drill CHE 75
 Miller
 Geologist

Start Date May 24/82
 Completion Date May 26/82
 Ground El.
 Groundwater El.
 at completion
 after days
 Total Depth of Boring 16

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface			BECA 0915	
	0"	Black Sand Topsoil	4			
	1"	Tan Sand.	4			
	2	Brown Sand - Fine Gravel	3			
	3		3			
	4		2			
	5		1.			
	6		1.			
	6	WA Brown Sand - Fine Gravel - WATER @ 6'	3			
	7		15			
	7		9.			
	8		17.			
	8	No Sample Recovered				
	9	8-12'				

11/13/81

DRILLING LOG

Page ____ of ____

State _____

Start Date _____

Site _____

Completion Date _____

Boring No. _____

Ground El. _____

Drilling Firm _____

Groundwater El.
at completion _____

Type of Drill _____

after ____ days _____

Driller _____

Total Depth of Boring _____

Geologist _____

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	10	Brown Waxy Sand				
	11					
	12	Gray Clay				
	13		27			
	14		30			
	15					
	16	End of Hole				
		Backfill with Cement & Gravel				

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW-7.5
ELEVATION _____

DATE 6-3-52

PROJECT _____

LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	4	FT. 0	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	7	FT. 9	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>UQD-1</u>		

CREW CHIEF Sheelsky HELPER D.J.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Blows / 5"	Penetration
	0					
	1			<u>Sandy clay brown moist</u>		
	2					
	3					
	4		<u>3'9"</u>	<u>SAND FINE TO MED COARSE brown wet</u>		
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12		<u>11'6"</u>	<u>Sandy clay grey moist</u>		
	13					
	14		<u>14'0"</u>	<u>EOB</u>		
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

Page ___ of ___

State _____

Start Date _____

Site _____

Completion Date _____

Boring No. UGW 8 continued

Ground El. _____

Drilling Firm _____

Groundwater El. at completion _____

Type of Drill _____

after ___ days _____

Miller _____

Total Depth of Boring _____

Geologist _____

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	10	Fine coarse Sand & Gravel	11	11		
	11	Gray clay till		12	Photograph	
	12	Gray clay Till				
	13	Gray clayey Till	23-1' 23-6"	13		
	14	End of boring				
	15					
	16					

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. 1)GW 5

DATE 6-8-82

ELEVATION _____

PROJECT _____

LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	6	FT. 0	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	8	FT. 9	INS.
G.W. AFTER	MRS.	FT.	INS.
G.W. VOLUMES	HEAVY		

REW CHIEF Shelley HELPER OT

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 5"	Penetration
	0				
	1			SILTY SAND BLACK MOIST	
	2		1'0"	SILTY SAND SOME PEPPER RED TO	
	3			BROWN MOIST	
	4				
	5				
	6				
	7		6'0"	fine brown clay	
	8				
	9				
	10				
	11		10'0"	clayey SILT GREY MOIST	
	12		11'0"	loamy clay GREY MOIST	
	13				
	14		13'6"	EOB	
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST.-LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

Page 1 of 1

State Michigan

Start Date 5/24/82

Site Velsicol

Completion Date 5/24/82

Boring No. UGW 9

Ground El. _____

Drilling Firm Michigan Testing Engr.

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 9.5

Geologist Ron St. John

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Gray, fn-coarse Sand w/some gravel	2			
	2	Gray-fn-coarse Sand w/fine gravel	3	1		
	3	same	3	2		
	4	same	3	3		
	5	same, Tan	4	4	H ₂ O @ 4'	
	6	same	2	5		
	7	3" same 9" Gray, clayey till	5	6		
	8	Gray, clayey fill	17	7	Sample dropped drilled new hole adjacent	
	9	Sand	21	8		
	10	End of boring		9		

11/13/81

DRILLING LOG

Page 1 of 1

State Michigan

Start Date 5/24/82

Site Velsicol

Completion Date 5/24/82

Boring No. UGW 10

Ground El. _____

Drilling Firm Michigan Testing Engineers Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Miller _____

Total Depth of Boring 7.0

Geologist Ron St. John

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Black, Sand & Gravel, fine-grained	2		H ₂ O @ 3E	
	2	Black, fine-grained Sand w/ some Gravel	3	1		
	3	Black, clayey Sandy Gravel	3	2		
	4	Tan, fine-grained Sand w/ some Gravel	1	3		
	5	Gray, clayey Till	6	4		
	6	Tan, silty clayey Till	5	5		
	7	Tan, clayey Till.		6		
	8	end of boring				
	9					
	10					

11/13/81

DRILLING LOG

State Michigan Start Date 5/24/82
 Site Velsicol Completion Date 5/24/82
 Boring No. UGW 11 Ground El. _____
 Drilling Firm Michigan Testing Engineers Groundwater El. _____
 Type of Drill CME 75 at completion _____
 after _____ days _____
 Geologist Ron St. John Total Depth of Boring 11.0

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Black, Sand, F _n -coarse, w/s. Gravel	2			
	2	Tan, F _n -coarse sand trace Gravel	4	1		
	3	Tan, Sand, Gravel	6	2		
	4	Gray, clayey Till	8	3		
	5	Tan F _n -coarse sand 3" 9" Till	10	4		
	6	Tan F _n -coarse Sand	9	5		
	7	Tan, F _n -coarse Sand	7	6		
	8	Tan, F _n -coarse Sand	9	7		
	9	Gray, clayey Till	14	8		
		Gray, clayey Till	12	9		

11/13/81

DRILLING LOG

Page ____ of ____

State _____

Start Date _____

Site _____

Completion Date _____

Boring No. USW 11 continued

Ground El. _____

Drilling Firm _____

Groundwater El.
at completion _____

Type of Drill _____

after ____ days _____

Driller _____

Total Depth of Boring _____

Geologist _____

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	10	Gray, clayey Till	18	10		
	11	end of boring				

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW 11.2'
ELEVATION _____

DATE 5-11-52

PROJECT _____

LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT. 6	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	7	FT. 0	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>Men</u>		

CREW CHIEF W. C. ... HELPER SM ...

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 5"	Penetration
	0					
	1			Silty sand plastic moist		
	2		0'6"	Silty sand plastic moist		
	3					
	4					
	5			Silty clay grey moist		
	6					
	7					
	8					
	9			8'0" EOB		
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. UGW 11.5

ELEVATION _____

DATE 6-8-52

PROJECT _____

LOCATION _____

CREW CHIEF Shelley HELPER D.J.

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	1	FT. 6	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION		FT.	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES <u>NOT TO BE TAKEN</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6"	Penetration
	0					
	1			Silty sandy top soil <u>CLAY MOIST</u>		
	2		0'9"	<u>CLAY MOIST</u>		
	3					
	4		3'0"	<u>Sandy clay Gney MOIST</u>		
	5					
	6		5'0"	<u>EOB</u>		
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

State Michigan Start Date 5/24/82
 Site Velsirel Completion Date 5/24/82
 Boring No. UGW 12 Ground El. _____
 Drilling Firm Michigan Testing Engineers Groundwater El. _____
 Type of Drill CME 75 at completion _____
 after _____ days _____
 Geologist Ron St. John Total Depth of Boring 6.0

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Blue, fine-course Sand	2		420 @ 25	
	2	Tan, fine-course Sand	4	1		
	3	SAME	7	2		
	4	Gray, clayey Till	10	3		
	5	Gray, clayey Till w/3.5" coarse Sand lense	11	4		
	6	Gray, clayey Till w/2.0" fine Sand lense	9	5		
	7		11			
	8					
	9					
	10					

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MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. 1) GU-17.5

DATE 6-8-82

PROJECT St. Louis

ELEVATION _____

LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT. 6	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	3	FT. 9"	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	MFO TO HEAD		

CREW CHIEF Shelby HELPER DJ

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Blows / 5"	Penetration
	0					
	1			Silty sand some pebbles dark brown moist		
	2		1'0"	Saw fine brown moist		
	3					
	4					
	5					
	6					
	7		6'0	Sandy clay gray moist		
	8					
	9		8'0	EOB		
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

State Michigan

Start Date 5/25/82

Site Valsicol

Completion Date 5/25/82

Boring No. UGW 13

Ground El. _____

Drilling Firm Michigan Testing Engineers Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days

Driller _____

Total Depth of Boring 10.5

Geologist Ron St. John

- all samples down to 4.20 table (except surface) have been taken as composite to be analysed for chemical

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Black to Tan, F _n -course Sand w/ trace F _n Gravel	3		H ₂ O @ 15'	
	2	Tan, F _n -course Sand	6	1		
	3	Same	4	2		
	4	Gray, F _n -course Sand, trace Gravel	26	3		
		Gray, 4" F _n course Sand 8" at clayey Till	14	4		
	6	Gray, silty Sandy Gravel	17	5		
	7	Gray, F _n ga Sand	15	6		
		Gray, 6" F _n Sand	11	7		
	8	Gray, 6" clayey Till	14	8		
	9	Gray, clayey Till	14	8		
	10	Gray, clayey Till	22	9	took 15' sample	

11/13/81

end of boring

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW-13.5

DATE 6-8-62

ELEVATION _____

PROJECT St Louis

LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	5	FT 0"	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	9	FT 3"	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>HEAVY</u>		

CREW CHIEF Shookley HELPER D.J.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6"	Penetration
	0					
	1			<u>Sandy clay DARK BROWN MOIST</u>		
	2		1'3"	<u>SAID FINE BROWN MOIST</u>		
	3					
	4					
	5					
	6					
	7					OIL
	8					
	9					
	10					
	11		9'9"	<u>Sandy clay grey MOIST</u>		
	12					
	13					
	14		13'6"	<u>EOB</u>		
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D - DISTURBED U - UNDIST. LINER - S.T. - SHELBY TUBE S.S. - SPLIT SPOON - R.C. - ROCK CORE OTHER -

DRILLING LOG

State Michigan

Start Date 5/25/82

Site Velsicol

Completion Date 5/25/82

Boring No. UGW 14

Ground El. _____

Drilling Firm Michigan Testing Engineers

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 7.0

Geologist Ron St. John

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Red to Tan, F _n -med grn Sand	3		H ₂ O @ 12'	
	2	Orange, F _n -coarse Sand, w/ F _n Gravel	6	1		
	3	Tan, F _n -coarse Sand	9	2		
	4	8" Tan, F _n -coarse Sand	7	3		
	5	4" Tan, clayey Till	12	4		
	6	Gray, clayey Till	15	5		
	7	Gray, clayey Till w/ sand lenses	8	6		
	8	end of boring				
	9					
	10					

11/13/81

DRILLING LOG

State Michigan
 Site Velsicol
 Boring No. UCW 15
 Drilling Firm Milb Test. Eng.
 Type of Drill CME 75
 Miller _____
 Geologist Ron St. John

Start Date 5/25/82
 Completion Date 5/25/82
 Ground El. _____
 Groundwater El. _____
 at completion _____
 after _____ days _____
 Total Depth of Boring 8.0

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Tan, fn - med grn Sand	4			
	2	Same	7			
	3	Tan, fn - coarse Sand	8		H ₂ O @ 2.5	
	4	Tan, fn - coarse Sand	7			
	5	Tan, fn - coarse Sand w/ gravel - 9" 3" clayey Till; 3" diesel oil above clay	7			
	6	Gray, clayey Till	4		1st sample 2nd sample	
	7	Gray, clayey Till	12			
	8	Same end of boring				
	9					
	10					

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW 15.
ELEVATION _____

DATE 6-9-82

PROJECT St. Louis

LOCATION _____

CREW CHIEF Shelby HELPER Scott

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	4	FT.	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION		FT.	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>LIGHT</u>		

Serial Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 5'	Penetration
	0					
	1			SILTY SAND		
	2					
	3		7'9"	SILTY SANDSTONE SANDY SILT		
	4					
	5		4'9"	SANDY SILT WITH SOME GRAVEL		
	6			STONE SANDY SILT		
	7					
	8					
	9		8'0"	EOB		
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

Page 1 of 2

State Michigan

Start Date 5/25/82

Site Velsicol

Completion Date 5/25/82

Boring No. UGW 16

Ground El. _____

Drilling Firm Michigan - Testing Eng

Groundwater El. _____
at completion _____

Type of Drill ME 75

after _____ days _____

Driller _____

Total Depth of Boring 13.0

Geologist Ron St. John

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	1' mottled gray sandy Clay Till Smelled like fuel oil	6		H ₂ O @ 25'	
	2	1' Gray, fm-med grn Sand Smells like fuel oil	5			
	3	1' Gray, fm-med Sand, fuel oil streak	2			
	4	1' Brown & gray clay w/sand lense saturated w/fuel oil	4			
	5	1' Gray, clay & 9" Sand lense	5			
	6	1' Gray, fm-coarse Sand	7			
	7	1' Gray, fm-coarse Sand	11			
	8	1' Gray, fm-coarse Sand	9			
	9	9" gray Sand 3" clayey Till	18			
	10	6" Sand 6" clay Till	21			

11/13/81

DRILLING LOG

State Michigan Start Date 2/25/82
 Site Velsicol Completion Date 2/25/82
 Boring No. UGW 17 Ground El. _____
 Drilling Firm Michigan - Testing Engineers Groundwater El. _____
 Type of Drill CME 75 after _____ days _____
 Driller _____ Total Depth of Boring 8.0
 Geologist Ren St. John

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Orange, fine sand	2		H ₂ O @ 3'	
	2	Black, fine med sand, fuel oil	3			
	3	Gray, fine med sand, fuel oil	7			
	4	Gray, fine med sand / fuel oil	5			
	5	Brown, sandy clay till	9		} 2 ^o sample	
	6	Brown, clayey till	7			
	7	Gray, clayey till	11			
	8	Gray, clayey till				
	9					
	10					

11/13/81

State _____

Start Date _____

Site _____

Completion Date _____

Boring No. UGW 16 continued

Ground El. _____

Drilling Firm _____

Groundwater El. _____
at completion _____

Type of Drill _____

after _____ days _____

Miller _____

Total Depth of Boring _____

Geologist _____

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	11	Gray, sandy clay Till	13		} 2 nd sample	
	12	Gray, clayey Till	12			
	13	Gray, clayey Till End of Boring	16			
	14					
	15					
	16					

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. UGW-16.1

ELEVATION _____

DATE 6-9-82

PROJECT S. Lows

LOCATION _____

CREW CHIEF [Signature] HELPER [Signature]

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	4	FT. 0	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION		FT.	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>None</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows/5'	Penetration
	0				
	1			Very sandy soil, porous & friable	
	2			Dark brown silty sand	
	3		1'6"	Silty sand with some saturation with water	oil
	4				
	5		4'9"	Light fine grey sand	
	6				
	7				
	8		7'0"	Lightly grey sand	
	9		8'0"	EOB	
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. 1GW 17.
ELEVATION _____

DATE 6-9-87.

PROJECT Low

LOCATION _____

CREW CHIEF Therika

HELPER Sam

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT.	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION		FT.	INS.
G.W. AFTER		HRS.	FT.
G.W. VOLUMES	LIGHT		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Penetration <small>Blows/5"</small>
	0				
	1			Sandy silt black moist	
	2		1'6"	Sandy silt brown moist	
	3			slight chemical odor	
	4				
	5		4'0"	Sandy clay with some pebbles	
	6			& stone particles moist	
	7		5'0"	Sandy clay some pebbles grey	
	8			moist	
	9		8'0"	EOB	
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF-SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

DRILLING LOG

State Michigan

Start Date 5/25/82

Site Velsicol

Completion Date 5/25/82

Boring No. UGW 18

Ground El. _____

Drilling Firm Michigan Testing Enginee

Groundwater El. _____

Type of Drill CME75

at completion _____

iller _____

after _____ days _____

Geologist Ron St. John

Total Depth of Boring 16.0

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Sand & Gravel	3		H ₂ O C-3	
	2	Gray, fine sand, fuel oil	5		} Missed because they washed out - so must have been sn-c	
	3	Black, fine-crss Sand & fine-med Grav.	5			
	4	Tan, fine-grn Sand	8			
	5	Tan, fine-grn Sand				
	6	Tan, fine-grn Sand				
	7	Tan, fine-crss Sand & fine Gravel	11			
	8	N.R.	8			
	9	6" Sand - fine coarse	5			
	10	6" Gray, clayey Till	12			

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW-18.5
ELEVATION _____

DATE 6-9-82

PROJECT St. Louis

LOCATION _____

CREW CHIEF Shankley HELPER Smith

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT.	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	4	FT.	INS.
G.W. AFTER		FT.	INS.
G.W. VOLUMES	<u>Heavy</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 5"	Penetration
	0					
	1			Silty sand some debris with		
	2			slag black moist		
	3			1'6" Same fine brown very moist		
	4			gas over		
	5					
	6					wet
	7					
	8					
	9					
	10			1'6" silty sand some debris & stones		
	11			10'6" grey moist		
	12					
	13			13'0" EOB		
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON. R.C.-ROCK CORE OTHER-

DRILLING LOG

Page 1 of 1

State Michigan

Start Date 5/25/82

Site Velsicol

Completion Date 5/25/82

Boring No. UGW 19

Ground El. _____

Drilling Firm Michigan Testing, Eng.

Groundwater El. _____
at completion _____

Type of Drill CME 75

after _____ days _____

Driller _____

Total Depth of Boring 10.0

Geologist Ron St. John

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	1	Brown, clay, silt, sand, & gravel	17		H ₂ O @ 35'	
	2	Brown to black sand & gravel	12			
	3	Blue to gray, clayey sand	8			
	4	Green, clayey sand	4			
	5	Gray, fine med sand	7			
	6	N.R.	4			
	7	Coarse sand & gravel	4			
	8	Gray, clayey Till	5			
	9	Gray, clayey Till	14			
	10	Gray, clayey Till	13			

11/13/81

end of boring

BORING NO. UGW 20

DATE 5/26/82

ELEV.

St. Louis/Velsicol

Personnel

Location of Boring
along South Fence line

COLOR MOISTURE COMPACTNESS CONSIST

FROM ELEV.	TO ELEV.	TOP	BOTTOM	NUMBER OF BLOWS	MOISTURE CONTENT	
0'		0'	1'	7		Brown, clay, silty, sandy, gravel
		1'	2'	7		Tan, fine-coarse Sand & Gravel
		2'	3'	4		Tan, fine-coarse Sand & Gravel
		3'	4'	4	100%	Tan, sandy Gravel
		4'	5'	3		Tan, sandy Gravel
6'		5'	6'	6		P.S. - clayey
6'		6'	7'	5		Tan to gray, clayey Till
		7'	9'	37		Gray, clayey Till
						ended of boring

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. UGW-70.5

DATE 6-9-82

PROJECT Low

ELEVATION _____

LOCATION _____

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	FT.	INS.		
G.W. ENCOUNTERED AT	FT.	INS.		
G.W. AFTER COMPLETION	FT.	INS.		
G.W. AFTER	HRS.	FT.	INS.	
G.W. VOLUMES	<u>None</u>			

CREW CHIEF Shalicki HELPER Smith

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 6"	Penetration
	0				
	1			Sandy silt black moist	
	2		1'3"	Silty sand fine grey moist	
	3				
	4				
	5		4'3"	Clayey sand with pebbles & some stone brown moist	
	6				
	7		6'3"	Sand clay grey to brown moist	
	8				
	9		8'0"	EOB	
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D--DISTURBED U.L--UNDISTURBED LINER S.T.--SHELBY TUBE S.S.--SPLIT-SPOON R.C.--ROCK CORE OTHER--

BORING NO. UG1W 21

DATE 5/26/82

ELEV.

FROM ELEV.	SOIL HORIZON		SAMPLE LIMITS		NUMBER OF BLOWS	MOISTURE CONTENT	St. Louis/Valsicol	Personnel		
	TO ELEV.	TOP	BOTTOM							
							Location of Boring			
							COLOR	MOISTURE	COMPACTNESS	CONSIST.
		0 ^o	1 ^o	7			Black to tan, Fr - Sand			
	2 ^o	1 ^o	2 ^o	3			Some			
		2 ^o	3 ^o	6			Brown, sandy Clay			
		3 ^o	4 ^o	10			Brown, Sandy Clay			
		4 ^o	5 ^o	13			Brown, sandy Clay			
		5 ^o	6 ^o	25	⁴⁰ 53		Brown Clay w/ sand & Gravel lenses > 4"			
6 ^o		6 ^o	7 ^o	18			Brown, Clayey w/ sand lenses			
		7 ^o	8 ^o	15			Brown, 4" sand, 8" clayey Till			
		8 ^o	9 ^o	20			Brown, 4" sand, 8" clayey Till			
10 ^o		9 ^o	11 ^o	60			1' Brown, Fine Sand; 1' Gray clayey Till			
		11 ^o	13 ^o	74			Gray, clayey Till			
							end of boring			

DRILLING LOG

Page 2 of 2

State _____

Start Date _____

Site _____

Completion Date _____

Boring No. UGW 19 continued

Ground El. _____

Drilling Firm _____

Groundwater El. _____
at completion _____

Type of Drill _____

after _____ days _____

Driller _____

Total Depth of Boring _____

Geologist _____

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		Ground Surface				
	11	Gray, fm-med sand	15			
	12	Gray, clayey Till w/3" sand lens	4			
	13	Gray, clayey sand	9			
	14	Gray, clayey Till	12			
	15	Gray, clayey Till	11			
	16	Gray, clayey Till	15			
		end of boring				

11/13/81

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. UG-U-21.5

ELEVATION _____

DATE 6-9-52

PROJECT Law

LOCATION _____

CREW CHIEF Sheolster HELPER Leah

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	10	FT. 6	INCH.
G.W. ENCOUNTERED AT		FT.	INCH.
G.W. AFTER COMPLETION	16	FT. 0	INCH.
G.W. AFTER	HRS.	FT.	INCH.
G.W. VOLUMES <u>APPX TO HQAU</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows/5" Penetration
	0				
	1			Clayey TOP SOIL DARK BROWN MOIST	
	2		0'6	Clayey SAND SANDY BROWN MOIST	
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10		9'3	Silt grey MOIST	
	11		10'6	Sandy silt BROWN WET	
	12		11'9	Clayey sandy silt SANDY BROWN GR.	
	13			MOIST	
	14				
	15				
	16				
	17				
	18		18'0	EOB	
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-



VELSICOL CHEMICAL CORPORATION

**CONTRACT DOCUMENTS
and
SPECIFICATIONS**

**Securement of Plant Site
PHASE II
St. Louis, Michigan**

**DRAFT
FOR REVIEW**

**PRINTED ON
JAN 26 1983**



VELSICOL CHEMICAL CORPORATION

**CONTRACT DOCUMENTS
and
SPECIFICATIONS**

**Securement of Plant Site
PHASE II
St. Louis, Michigan**

**January, 1983
Ref. No. 0803**

CONESTOGA-ROVERS & ASSOCIATES LIMITED

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INFORMATION FOR BIDDERS

B.01 DATE AND PLACE FOR SUBMITTING BIDS

Sealed Bids will be received on behalf of Velsicol Chemical Corporation (herein called the Owner) by Conestoga-Rovers & Associates Limited, 651 Colby Drive, Waterloo, Ontario, Canada, N2V 1C2

until 3:00 p.m. local time, _____, 1983.

Each Bid must be submitted in a sealed envelope, addressed to Mr. T. W. Shaffer, Manager of Environmental Engineering, Velsicol Chemical Corporation, c/o Conestoga-Rovers & Associates Limited, 651 Colby Drive, Waterloo, Ontario, Canada, N2V 1C2. Each sealed envelope containing a bid must be plainly marked on the outside as Bid for "Securement of Plant Site, Phase II, St. Louis, Michigan", and the envelope should bear on the outside the name of the Bidder and his address.

The Bid must be signed by an officer of the Company, designating the position and executed with the Company Seal.

In the case of an individual trading as a Company, the signatures of the person signing the Bid must be witnessed.

B.02 SCOPE OF WORK

The work comprises the final containment of the Plant Site including; installation of approximately 68,000 square feet of an impervious continuous soil/bentonite slurry containment wall along the downgradient side of the Velsicol Plant Site; construction of approximately 5,000 lineal feet of an internal groundwater collection system; construction of a 3 foot thick clay cap over the south 37 acres of the plant site; and installation of post construction monitoring facilities. The work also includes the provision of temporary on-site plant and facilities related to health and safety.

B.03 ENGINEER

The Engineer is Conestoga-Rovers & Associates Limited. Their address is 651 Colby Drive, Waterloo, Ontario, Canada, N2V 1C2.

B.04 BID DEPOSIT

Each Bid must be accompanied by a Bid Bond executed by the Bidder as Principal and having as surety thereon a Surety Company acceptable to the Owner, any of which must be in an amount not less than five percentum (5%)

of the amount of the base bid listed in the Form of Bid. Such security will be returned to all except the three (3) lowest formal Bidders within ten (10) days after the formal opening of Bids, and the remaining cash, checks or Bid Bonds will be returned to the three (3) lowest Bidders within forty-eight (48) hours after the Owner and the accepted Bidder have executed the Contract, or if no Contract has been executed within sixty (60) days after the date of opening of Bids, upon demand of the Bidder at any time thereafter, so long as he has not been notified of the acceptance of his Bid. A certified cheque may be substituted for the Bid Bond requested.

B. 05 EXAMINATION OF SITE

Each Bidder shall visit the site of the work before submitting his Bid and shall satisfy himself by personal examination as to the local conditions to be met with during the construction and conduct of the work. The Bidder is not to claim at any time after submission of his Bid that there was any misunderstanding of the terms and conditions of the Contract related to the site conditions.

B. 06 PRE-BID CONFERENCE

A pre-bid conference will be held at ____ a.m. on _____, 1983, in St. Louis, Michigan at the site offices, 701 West Washington Ave., St. Louis, Michigan, 48880. Representatives of the Owner and Engineer will be in attendance to discuss the proposed methods of complying with the requirements of the Contract Documents. A visit to the site of work and the Project borrow pit will also be included as part of the pre-bid conference.

The pre-bid conference is mandatory for all prospective bidders, and bids received from companies not attending the pre-bid conference will be returned by the Owner unopened.

An addendum will be issued containing the proceedings of the conference and a list of Contractors who will be eligible to bid.

B. 07 OMISSIONS, DISCREPANCIES AND INTERPRETATIONS

Should a Bidder find omissions from or discrepancies in any of the Bid Documents or should he be in doubt as to the meaning of any part of such Documents, he should notify the Engineer, preferably in writing, and not later than five (5) days before the closing date for Bids. If the Engineer considers that a correction, explanation or interpretation is necessary or desirable, he will issue an addendum to all who have taken out Bid Documents and all Bidders shall include the requirement of the addenda in Bids to be submitted for consideration.

Should the Bidder not agree that the materials and methods specified, or designed on the Drawings, will provide an installation to meet the requirements of the project, he shall notify the Engineer in writing stating his reason for objection and may submit a suggested alternative. In such event, the Engineer will make the final decision in selecting the alternative to be implemented.

B. 08 FEEES, PERMITS, LICENSES

The Contractor shall be responsible for obtaining all permits and the licenses required in the performance of the work and shall include the cost of permits, licenses and inspection fees or other charges made by concerned authorities in his total Bid price.

B. 09 JURISDICTION

Applicable Federal and State laws, municipal by-laws, permits and the rules and regulations of all authorities having jurisdiction over construction of the work shall apply to this Contract throughout and such laws, by-laws, permits and rules and regulations will be deemed to be included in this Contract as though written in full herein.

B. 10 AGREEMENT TO BOND

Every Bid shall be accompanied by an "Agreement to Bond" which shall be completed by a Surety Company lawfully doing business in the State of Michigan.

B. 11 BID LEFT OPEN

The Bidder shall keep his Bid open for acceptance for sixty (60) days after its submission.

B. 12 COMMENCEMENT AND COMPLETION

Bidders shall be prepared to commence work within seven (7) days of being given written notice by the Engineer to proceed and to continue in an expeditious manner and to complete substantially all the work in accordance with the Contract requirements.

B. 13 EQUIVALENTS

When equipment or materials, to be supplied under this Contract, are specified by their trade or other name, the Bidder may base his bid price on the supply of the named materials or equipment or an approved equal, subject to Written approval by the Engineer of the alternate equipment or material.

Prior to submission of bid, the Contractor may submit requests to the Engineer for substitution of equivalent material. Such submissions shall be accompanied by complete information on the material proposed for use.

The Engineer will review the request and give notice of its decision to the Contractor.

B. 14 ALTERNATE CONSTRUCTION PROCEDURES

Experience gained during execution of similar projects has been reflected in construction procedures suggested on the Contract Drawings. The Bidder shall submit his Bid based on the construction procedures suggested. The successful Contractor may submit alternate construction procedures for approval to the Engineer within one (1) week of the notification of award of the Contract. Appropriate cost adjustments in the contract price will be negotiated prior to the Engineer granting approval of any such alternatives.

B. 15 AWARD OR REJECTION OF BIDS

The Contract will be awarded to the lowest responsible bidder complying with the conditions prescribed, provided his bid is reasonable and it is to the interest of Velsicol to accept it. The Bidder to whom the award is made will be notified promptly. Velsicol reserves the right to make awards in accordance with any of the bidding items, to reject any and all bids, and to waive any informality in bids, whenever such is in the interest of Velsicol. Velsicol reserves the right to require, prior to the award of the Contract, a statement of facts in detail of the business and technical organization and plant of the Bidder available for the contemplated work, including financial resources and experience of the organization in construction of comparable work. Subject to the right of Velsicol to reject any or all bids which are not in the best interest of Velsicol, an award will be made to the Bidder submitting the lowest bid.

B. 16 RESULTS OF BIDDING

All bidders will be notified concerning their bid, whether accepted or rejected, within a reasonable time following the time of opening. A written notice of award, if any, will be delivered to the selected bidder within sixty (60) days of opening of bids.

order, but no modifications involving substantial extra work or changes shall be made unless ordered in writing by the Engineer. The Contractor shall and will accept such modifications when ordered in writing by the Engineer, and the same shall not vitiate or void this Contract. Any such modifications so made shall not, however, subject the Contractor to increased expenses without equitable compensation. If such modifications result in a decrease in the cost of work involved, an equitable deduction from the Contract price, to be determined by the Engineer on the basis of unit prices Bid and accepted, shall be made.

The Owner may make alterations in the line, grade, plan, form, dimensions or materials of the work, or any part thereof, either before or after the commencement of construction. If such alterations diminish the quantity of work to be done, no claim for damages or for anticipated profits on the work dispensed with shall be warranted thereby or claimed therefor; and if they increase the amount of work, such increase shall be paid for according to the quantity actually done at the unit prices bid for such work under this contract, or in case there is no price established it shall be paid for as extra work in accordance with Section Fb. 04 of the Form of Bid.

The Owner will not accept any modifications that significantly changes the dimensions or appearance of any structure. If, however, the Contractor requests permission to use manufactured equipment that would necessitate changes in the interior layout of a structure such as the relocation of equipment, structural supports, platforms, access, and similar components, the Owner reserves the right to grant such permission. If permission for such modifications is granted, the Contractor shall be responsible for all resulting revisions. He shall be responsible for and pay the cost of the preparation of revisions in plans and the cost of any additional construction occasioned by the requested revisions. In the preparation of the revised plans, clearance access, walkway widths, headroom and other structural and equipment layout features shall be equal to those shown on the original Plans. All materials involved in the redesign shall conform to the applicable provisions of the Project Specifications.

Any modifications in work required under other contracts to accommodate the changed design will be incorporated in the appropriate Contracts and any resulting increases in contract prices will be deducted by the Owner from payments otherwise due the Contractor who initiated the changed design.

Fb. 04 PAYMENT FOR EXTRA WORK AND CREDIT FOR DELETIONS

The Contractor shall and will do any work and furnish any materials not herein provided which, in the opinion of the Engineer, may be found necessary or advisable for the proper completion of the work or the purposes thereof, or any modification or alterations. All extra work and materials shall be ordered in writing by the Engineer, and in no case will any work or materials in excess of the amount shown by said Plans and Specifications be paid for unless so ordered. The Contractor further agrees that he will accept as full compensation for such extra work and

materials the unit prices Bid, in the case of items covered by unit prices in the proposal, and no more; and for such items as are not covered by a unit price, he will accept as full compensation the unit price or lump sum price agreed to by him and the Engineer.

Where there are no applicable unit prices for extra work ordered pursuant to this Specification and agreed prices cannot be readily established or substantiated, the Contractor shall be paid the actual and reasonable cost of:

1. Necessary materials (including transportation to the site). Materials used, if acquired by direct purchase, must be covered by receipted bills or acceptable invoices. All prices on used material incorporated in either temporary or permanent work shall be billed at a fair value, less than the original cost when new. A reasonable salvage credit shall be given for all salvagable material recovered. Salvage value of substantial material recovered must be determined jointly by the Contractor and the Engineer; plus
2. Necessary direct labor charges. Each class of labor shall be billed separately, preferably at actual payroll rates. Average rates based on different classes of labor, will not be accepted; plus
3. Payment required to be made to labor organizations under existing labor arrangements; plus
4. Sales taxes as required by law; plus
5. Equipment and plant rentals, other than small tools, as follows:

The base hourly rate shall be the daily rate as listed in the current year Blue Book divided by eight (8).

The first twenty (20) hours will be paid at 90% of the base hourly rate.

For twenty-one (21) to forty (40) hours, the rate will be 80% of the base hourly rate.

For over forty (40) hours, the rate will be 45% of the base hourly rate.

To each of the above rates, the estimated hourly operating cost, as listed in the Blue Book, shall be added.

The number of hours to be paid for shall be the number of hours that the equipment or plant is actually used on a specified force account.

Equipment to be used by the Contractor shall be specifically described and be of suitable size and suitable capacity required for the work to be performed. In the event the Contractor elects to use equipment of a higher rental value than that suitable for the work, payment will be made at the rate applicable for the suitable equipment. The equipment actually used and the suitable equipment paid for will be recorded as part of the record for

force account work. The Engineer shall determine the suitability of the equipment. If there is a differential in the rate of pay of the operator of oversize or higher rate equipment the rate paid for the operator will likewise be that for the suitable equipment.

In the event that a rate is not established in "The Blue Book" for a particular piece of equipment or plant, the Engineer shall establish a rate for that piece of equipment or plant that is consistent with its cost and use.

It is mutually understood that the base daily rates include all costs incidental to equipment and plant rentals including cost of moving to and from the site; plus

6. Fifteen percent (15%) of the total material cost (Bare Cost F. O. B.) and direct labor cost (actual hours worked multiplied by regular hourly wage rates) as compensation for profit and overhead.

If any of the work is performed by a subcontractor the Contractor shall be paid the actual and reasonable cost of such subcontracted work computed as outlined above or on such other basis as might be approved by the Engineer, plus an additional allowance of five percent (5%) of materials and direct labor to cover the Contractor's profit, superintendence, administration, insurance and other overhead. The cost of transportation of materials shall be excluded when computing the above described charges for profit and overhead.

In computing the value of a change order which involves additions and deductions of work not covered by unit prices in the Form of Bid, where the added work exceeds the omitted work, overhead and profit shall be computed on the amount by which the cost of the additional work exceeds the cost of the omitted work.

In computing the value of a change order which involves deductions and additions of work not covered by unit prices in the Form of Bid, where the omitted work exceeds the added work, the Contractor shall credit ten percent (10%) for overhead and profit on the amount of work deducted.

In computing the value of a change order wholly or partially involving the work covered by unit prices listed in the Form of Bid, the value of that portion of the work covered by the unit prices shall be determined for both additions and/or deductions of work using the Bid unit prices, with no additional allowance made or credit taken for overhead and profit.

Overhead may be defined to include the following items:

- a) Premium on bond;
- b) Premium on insurance required by the State other than Workmen's Compensation Insurance, public liability and property damage insurance, unemployment insurance, Federal old-age benefits, other payroll taxes and such reasonable charges that are paid by the Contractor pursuant to written agreement with his employee;

- c) All salary and expenses of executive officers, supervising officers or supervising employees;
- d) All clerical or stenographic employees;
- e) All charges for minor equipment, such as small tools, including shovels, picks, axes, saws, bars, sledges, lanterns, jacks, cables, pails, wrenches, air tools, pumps, etc. and other miscellaneous supplies and services;
- f) All drafting room accessories such as paper, tracing cloth, blueprinting, etc.

Payment for force account work will be made on the basis of the following reports:

1. The Contractor will deliver to the Engineer a daily summary of force account work done on the Contract. This summary on 8-1/2" x 11" paper will be delivered to the Engineer not later than closing time on the day following that for which the work is reported.
2. The summary shall contain:
 - a) A list of materials used indicating the amount and nature of each material. The cost (if known) should also be included. This must be later documented by proper receipts.
 - b) A list of equipment used indicating the number of hours used and the kind, type and size of equipment.
 - c) A list of personnel by name, including the hours and rate at which they were used on the force account work.
 - d) A statement of the work accomplished by force account for that day.
 - e) This summary will be dated and signed by the Contractor's authorized representative and the Engineer.
 - f) The Contract number and other identification as well as the name of the Contractor shall appear on the statement.
 - g) The Engineer will make any notations, remarks or comments on this form that may assist in final payments.

Contractor's Cost Records

The Contractor shall maintain records of all payrolls and of the details that comprise his total cost pursuant to any of the provisions under the headings, Extra Work and Deductions, and he shall at any time within three (3) years following the date of acceptance of the project, make such records available, upon request therefor, to the Owner for review and audit, if deemed necessary by the Engineer or the Owner. In case all or

part of such records are not made so available, the Contractor understands and agrees that any items not supported by reason of such unavailability of the records shall be disallowed, or if payment therefor has already been made, the Contractor shall, upon demand in writing by the Engineer or the Owner, refund to the Owner the amount so disclosed.

The Contractor agrees to prosecute such extra work with all reasonable diligence, and to employ thereon competent men. The Contractor shall give the Engineer or the Owner access to all accounts, bills, payrolls and vouchers relating to extra work not covered by unit prices unless a statement in writing of the actual cost of the same, fully itemized as to labor, materials and equipment is presented to the Engineer before the thirtieth (30th) day of the month following that during which each specific order was complied with by him.

Fb. 05 CLAIMS FOR UNAUTHORIZED EXTRA WORK

If the Contractor performs work which he considers is not included under any of the items of the Contract and which has not been specifically ordered in writing by the Engineer as extra work, he shall make claim for extra payment for such work by immediate oral notice followed by written notice within seven (7) calendar days after the occurrence to the Engineer, and shall submit detailed cost data to support his claim within thirty (30) calendar days after the said work is performed. Should such work extend over a period of more than thirty (30) days, he shall submit monthly records of all cost data relating to the claim for extra payment of such work. The Engineer will either approve or deny the claim for extra work and shall provide a reason for his decision in writing within thirty (30) calendar days of the Contractor's claim.

Fb. 06 COMMENCEMENT AND COMPLETION

Bidders shall be prepared to commence work within seven (7) calendar days of being given written notice by the Engineer to proceed and to continue in an expeditious manner and to complete substantially all the work in accordance with the Contract requirements. All of the work in this Contract shall be completed within one hundred and fifty (150) calendar days of the date of Notice to Proceed.

Fb. 07 AWARD OF CONTRACT

Acceptance of a Bid will be evidenced by Notice of Award of Contract by the Owner, in writing, delivered in person or by registered mail to the Bidder whose Bid is accepted. No other act of the Owner shall constitute acceptance of a Bid. The award of a Contract shall obligate the Bidder whose Bid is accepted to furnish Bonds, evidence of insurance, evidence of good standing with the Workmen's Compensation Board and execute the Agreement set forth in the Contract Documents.

Fb. 08 EXECUTION OF CONTRACT

The Contract Agreement shall be executed in quadruplicate by the successful Bidder and returned, together with contract bonds, evidence of insurance and required letters within seven (7) calendar days after receiving written notice of the award of the Contract. After execution by the Owner, one copy shall be returned to the Contractor.

If the Bidder refuses or fails to execute the Contract Agreement within seven (7) calendar days after the award, it will be considered that the Bidder has abandoned all rights and interests in the award in which case the Bid Bond, or certified check, accompanying the Bid Proposal shall become the property of the Owner.

Fb. 09 INDEPENDENT CONTRACTOR

The Contractor shall be an independent contractor, maintaining control over his own employees and operations; and neither the Contractor nor anyone employed by the Contractor shall be deemed to be a servant, employee or agent of Velsicol. The Contractor shall be responsible for and shall withhold or pay, or both, as may be required by law, all Federal State and local taxes and contributions with respect to, measured by, or based upon compensation paid to or earned by the Contractor's employees.

Fb. 10 VARIANCES IN ESTIMATED QUANTITIES

Should any field measured pay item quantity vary by more than plus or minus fifteen percent (15%) from the estimated quantity detailed on the bid sheet, and should the pay item be a Major Item as defined herein, the Contractor shall, safely at the Engineer's option, renegotiate with the Engineer the unit price bid for that item.

A Major Item is defined as any Contract bid item which has a total bid value or a total as constructed value of 5 percent (5%) or greater of the Contract total base bid value. The Contract total base bid value shall be the sum indicated in Clause Fb. 01.

Fb. 11 ADDENDA

We acknowledge receipt of Addenda numbered _____ to _____ inclusive, and the Contract Price includes the provisions set out in the issued Addenda.

BID SUMMARY SHEET

SECUREMENT OF PLANT SITE

ST. LOUIS, MICHIGAN

SECTION A	PROJECT STARTUP	\$ _____
SECTION B	DOWNGRAIENT CONTAINMENT WALL	\$ _____
SECTION C	HEALTH AND SAFETY PLAN	\$ _____
SECTION D	INTERNAL GROUNDWATER COLLECTION SYSTEM	\$ _____
SECTION E	FINAL COVER	\$ _____
SECTION F	RIP RAP	\$ _____
SECTION G	ON-SITE MAINTENANCE	\$ _____
SECTION H	PROJECT CLOSEOUT	\$ _____

	TOTAL BASE BID	\$ _____

The undersigned propose to perform the work, furnish all materials, and complete the work in its entirety in the manner and under the conditions required at the prices listed above.

Name of Bidder: _____

Signature of Authorized Officer: _____

Title: _____

Witness: _____

Date: _____

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
A.	<u>PROJECT STARTUP</u>				
A-1	Mobilization	1	L. S.		
A-2	Medical Surveillance	35	PERSON		
A-3	Bond and Insurance	1	L. S.		
				TOTAL SECTION A	\$

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
B.	<u>DOWNGRADIENT CONTAINMENT WALL</u>				
B-1	Excavate, transport, place and compact clay working platform	5,900	C.Y.		
B-2	Excavate, transport, place and compact clay control berms	2,800	C.Y.		
B-3	Construct downgradient containment wall	68,000	S.F.		
B-4	Excavate, transport and mix imported material for containment wall backfill	6,300	C.Y.		
B-5	Supply quality control testing during containment wall installation	1	L.S.		
				TOTAL SECTION B	\$

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
D.	<u>INTERNAL GROUNDWATER COLLECTION SYSTEM</u>				
D-1	Sta. 0+00 to MHS4 6"Ø Perforated Clay Pipe Avg. depth to invert = 5.7'	250	L.F.		
D-2	MHS4 to MH3 6"Ø Perforated Clay Pipe Avg. depth to invert = 10.7'	300	L.F.		
D-3	MH3 to MH2 6"Ø Perforated Clay Pipe Avg. depth to invert = 15.2'	100	L.F.		
D-4	Interceptor @ MH2 4"Ø Perforated Clay Pipe Avg. depth to invert = 14.8'	250	L.F.		
D-5	MH2 to MH1 6"Ø Perforated Clay Pipe Avg. depth to invert = 15.0'	350	L.F.		
D-6	Interceptor @ MH1 6"Ø Perforated Clay Pipe Avg. depth to invert = 11.6'	140	L.F.		
D-7	MH1 to end of 6" subdrain 6"Ø perforated Clay Pipe Avg. depth to invert = 12.6'	140	L.F.		
D-8	MHS4 to MH5 6"Ø Perforated Clay Pipe Avg. depth to invert = 4.5'	610	L.F.		
D-9	MH5 to MHS6A 6"Ø Perforated Clay Pipe Avg. depth to invert = 3.6'	430	L.F.		
D-10	Interceptor @ MHS6A 4"Ø Perforated Clay Pipe Avg. depth to invert = 5.8'	550	L.F.		
D-11	MHS6B to MH7 6"Ø Perforated Clay Pipe Avg. depth to invert = 4.1'	250	L.F.		

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
D-12	Interceptor @ MHS6B 4"Ø Perforated Clay Pipe Avg. depth to invert = 5.7'	400	L.F.		
D-13	Interceptor @ MH7 4"Ø Perforated Clay Pipe Avg. depth to invert = 5.6'	460	L.F.		
D-14	MH7 to MHS8 6"Ø Perforated Clay Pipe Avg. depth to invert = 2.9'	250	L.F.		
D-15	Interceptor @ MHS8 4" Ø Perforated Clay Pipe Avg. depth to invert = 3.4'	350	L.F.		
D-16	MHS8 to MHS8A 6"Ø Perforated Clay Pipe Avg. depth to invert = 2.9'	150	L.F.		
D-17	MHS8A to MH9 6"Ø Perforated Clay Pipe Avg. depth to invert = 2.7'	115	L.F.		
D-18	MH9 to MHS10 6"Ø Perforated Clay Pipe Avg. depth to invert = 2.3'	250	L.F.		
D-19	Interceptor @ MHS10 4"Ø Perforated Clay Pipe Avg. depth to invert = 3.0'	400	L.F.		
D-20	MHS10 to MH11 6"Ø Perforated Clay Pipe Avg. depth to invert = 3.1'	175	L.F.		
D-21	MH11 to MHS12 6"Ø Perforated Clay Pipe Avg. depth to invert = 3.5'	165	L.F.		
D-22	MHS12 to MH13 6"Ø Perforated Clay Pipe Avg. depth to invert = 2.7'	325	L.F.		
D-23	MH13 to MHS14 6"Ø Perforated Clay Pipe Avg. depth to invert = 2.7'	590	L.F.		

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
D-24	MHS14 to Sta. 40+45 6"Ø Perforated Clay Pipe Avg. depth to invert = 4.6'	320	L.F.		
D-25	Complete installation of interceptors at MHS14 and MHS12 and connect into respective manhole sumps	100	L.F.		
D-26	Installation of 48"Ø manholes c/w bolt down frames and lids:	102	V.F.		
D-27	Installation of 96"Ø manhole sumps c/w bolt down frames and lids:	65	V.F.		
D-28	Excavate and place granular sumps @ upgradient ends of drain and interceptors	10	Ea.		
D-29	Install, operate and maintain all labor equipment and material required to dewater trench excavation including transport of collected water to on-site holding tank	1	L.S.		
				TOTAL SECTION D	\$ _____
					=====

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
E.	<u>FINAL COVER</u>				
E-1	Install gas venting systems	8	Ea.		
E-2	Proof rolling entire site	1	L.S.		
E-3	Excavate, transport, place and compact clay for clay cap	170,000	C.Y.		
E-4	Supply and place sand blanket between clay cap and topsoil	28,000	C.Y.		
E-5	Excavate, transport, spread and fine grade topsoil over entire Plant Site	43,000	C.Y.		
E-6	Seed and mulch entire Plant Site	52	Ac.		
E-7	Place sod along ditches on Plant Site	11,000	S.Y.		
E-8	Supply and place granular material for on-site access upon completion of site encapsulation	3,250	Ton		
E-9	Supply and place water for compaction of clay cap	20	M. Gal.		

TOTAL SECTION E \$

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
F.	<u>RIP RAP</u>				
F-1	Supply and place filter fabric prior to placing rip rap	134,000	S. F.		
F-2	Supply, transport and machine place rip rap along Pine River shoreline	13,500	S. Y.		
F-3	Tie in upper edge of filter fabric to rip rap with 6" thick lean grout cap	4,040	L. F.		
				TOTAL SECTION F	\$

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
G.	<u>ON-SITE MAINTENANCE</u>				
G-1	Excavate and dispose on Plant Site concrete and steel debris from trench excavations	1	L.S.		
G-2	Excavate, transport and compact clay fill over disposed spoils	7,000	C.Y.		
G-3	Provide mechanical road sweeper as directed by the Engineer	160	Hr.		
G-4	Supply and distribute calcium chloride as required by the Engineer	70,000	Gal.		
G-5	Supply and install 8' high 2" x 2" chain link fence c/w one 20' wide vehicle gate and one 4' wide man gate	3,360	L.F.		
G-6	Construct and maintain and remove sedimentation control structures along Pine River embankment	1	L.S.		
G-7	Excavate, transport and dispose of upper 12" of material within 50' easement following removal of temporary facilities	750	C.Y.		
G-8	Backfill 50' easement excavation with 6 inches of imported fill and 6 inches of imported topsoil	750	C.Y.		
G-9	Clean, maintain and restore County and City of St. Louis roadways used as haulage routes	1	L.S.		

TOTAL SECTION G \$

FORM OF BID

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ESTIMATED QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL PRICE</u>
H	<u>PROJECT CLOSEOUT</u>				
H-1	Decontaminate equipment	1	L S.		
H-2	Clean up and demobilize	1	L S.		

				TOTAL SECTION H	\$
					=====

SECTION I. ADDITIONAL UNIT PRICES

The Contractor also agrees to accept payment at the following Bid Unit Prices for work done and materials supplied if and when directed by the Engineer. The Bid Prices include material, plant, labor, repairs, fuel, maintenance, overheads, supervision and profit in accordance with the specifications.

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	
1.	Superintendent	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
2.	Foreman, including pick up truck	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
3.	Operator	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
4.	Laborer	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
5.	Tradesman (electricians, plumbers, carpenters, etc.)	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
6.	Teamster	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
7.	Office Engineer/Clerk	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
8.	Surveyor	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
9.	Low-boy with tractor			
		i) 16 - 40 tons	Hour	_____
			Day	_____
			Week	_____
			Month	_____

SECTION I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
	ii) 40 - 60 tons	Hour	_____
		Day	_____
		Week	_____
		Month	_____
10.	Backhoe crawler mounted, hydraulically operated		
	i) less than 2 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 2 c.y. to 2.5 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) greater than 2.5 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
11.	Front End Loader, Crawler mounted		
	i) Less than 2 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 2 c.y. to 2.5 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) greater than 2.5 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
12.	Front End Loader - Wheel mounted		
	i) less than 2 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 2 c.y. to 2.5 c.y.	Hour	_____
		Day	_____
		Week	_____
		Month	_____

SECTION I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
	iii) greater than 2.5 c. y.	Hour Day Week Month	_____ _____ _____ _____
13.	Tractor bulldozer crawler		
	i) less than 80 H. P.	Hour Day Week Month	_____ _____ _____ _____
	ii) 80 - 160 H. P.	Hour Day Week Month	_____ _____ _____ _____
	iii) 160 - 180 H. P.	Hour Day Week Month	_____ _____ _____ _____
	iv) Greater than 240 H. P.	Hour Day Week Month	_____ _____ _____ _____
14.	Dump trucks		
	i) Single rear axle	Hour Day Week Month	_____ _____ _____ _____
	ii) Tandem rear axle	Hour Day Week Month	_____ _____ _____ _____
	iii) Tri rear axle	Hour Day Week Month	_____ _____ _____ _____
	iv) Tractor-Trailer	Hour Day Week Month	_____ _____ _____ _____

SECTION I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
15.	Graders		
	i) Greater than 100 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 80 - 100 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) less than 80 H. P.	Hour	_____
		Day	_____
		Week	_____
		Month	_____
16.	Vibratory sheepsfoot roller self propelled		
	i) 10 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) Greater than 10 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
17.	Vibratory sheepsfoot roller - Towed		
	i) 10 ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) Greater than 10 ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
18.	Static pneumatic tired roller self propelled		
	i) 10 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____

SECTION I. ADDITIONAL UNIT PRICES (continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>
	ii) 10 ton to 25 ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) Greater than 25 ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
19.	Static pneumatic tired roller-towed		
	i) 10 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 10 Ton to 20 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) Greater than 20 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
20.	Crane-Crawler or Rubber Tired		
	i) 15 Ton or less	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	ii) 15 Ton to 25 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iii) 25 Ton to 50 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____
	iv) Greater than 50 Ton	Hour	_____
		Day	_____
		Week	_____
		Month	_____

SECTION I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>		
21.	Rubber tired tractor backhoe	i) 1/2 c.y. or less	Hour	_____	
			Day	_____	
			Week	_____	
			Month	_____	
	ii) 5/8 to 3/4 c.y.	Hour	Day	_____	
			Week	_____	
			Month	_____	
			Hour	_____	
	iii) Greater than 3/4 c.y.	Day	Week	_____	
			Month	_____	
			Hour	_____	
			Day	_____	
22.	Attachments to backhoes	i) HoePac compactor or equal	Hour	_____	
			Day	_____	
			Week	_____	
			Month	_____	
	ii) HoeRam breaker or equal	Hour	Day	_____	
			Week	_____	
			Month	_____	
			Hour	_____	
	23.	Compressor (Including Hoses)	i) less than 125 CFM	Hour	_____
				Day	_____
				Week	_____
				Month	_____
ii) 126 CFM to 175 CFM		Hour	Day	_____	
			Week	_____	
			Month	_____	
			Hour	_____	
iii) 176 to 375 CFM		Day	Week	_____	
			Month	_____	
			Hour	_____	
			Day	_____	
iv) Greater than 375 CFM	Week	Month	_____		
		Hour	_____		
		Day	_____		
		Week	_____		

SECTION I. ADDITIONAL UNIT PRICES (Continued)

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Unit Price</u>	
24.	Farm tractor (all sizes)	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
25.	Proof Roller (35 to 50 ton static weight)	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
26.	Generator	i) 5 KVA or less	Hour	_____
			Day	_____
			Week	_____
	Month		_____	
	ii) 5.5 KVA to 15 KVA	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	
	iii) Greater than 15 KVA	Hour	_____	
		Day	_____	
		Week	_____	
		Month	_____	

The prices submitted in this Table of "Additional Unit Prices" (Section I of the Form of Bid) do not affect the Contractor's Bid price on the project. The prices will be reviewed by the Engineer, and the Owner and the Engineer reserve the right to delete any price of the "Additional Unit Prices" that in their opinion is unbalanced or excessive; in such case work done under the item deleted will be negotiated in accordance with Section Fb.04.

AGREEMENT

VELSICOL CHEMICAL CORPORATION

CONTRACT NO:

THIS AGREEMENT, entered into this _____ day of _____, 19____,
by VELSICOL CHEMICAL CORPORATION, hereinafter referred to as the "Owner",
and _____,

a Corporation organized and existing under the laws of the
State of Michigan

a partnership, consisting of _____

an individual conducting business as _____

the location of whose principal office is _____

hereinafter called the "Contractor".

WITNESSETH: That the Owner and the Contractor, for the consideration
hereinafter named agree as follows:

ARTICLE 1 WORK TO BE DONE

The Contractor shall:

- a) furnish all the materials (except as provided in Article 3), appliances, tools and labor of every kind required, and construct and complete in the most substantial and workmanlike manner, the construction, improvement or reconstruction of the project generally identified and shown on the Plans entitled "Securement of Plant Site, Phase II, St. Louis, Michigan", in accordance with the Contract Documents and Specifications entitled "Securement of Plant Site, Phase II, St. Louis Michigan", which contain the information for bidders; form of proposal, agreement, and bonds; general specifications and conditions of contract; materials of construction; and payment items; and
- b) do everything required by the Contract (Contract Documents) as defined herein.

ARTICLE 2 DOCUMENTS FORMING THE CONTRACT

The Contractor (and Contract Documents) shall be deemed to include: the Contractor's proposal (Form of Bid); the Agreement; the General and Special Conditions; the "Specifications" referred to above; the plans; any addenda to Specifications if the same are issued prior to the date of receipt of proposal; and all provisions required by law to be inserted in the Contract whether actually inserted or not.

The Contract Documents consist of the sections listed below and should conflict appear within or between the various sections, priority shall be given in order of appearance in the following list.

1. Agreement
2. Plans
 - (a) General
 - (b) Details
3. Special Conditions, Bidding Information, Form of Bid
4. Project Specifications
5. General Conditions

ARTICLE 3. MATERIAL FURNISHED BY OWNER

The Owner will furnish to the Contractor within three (3) miles of the site of work, without cost, topsoil, common fill, and clay fill at source, lying in its natural state and condition, in quantity sufficient to complete the scope of work, and of quality to meet the detailed specifications for each material; and the personnel hygiene facility, and eight (8) gas venting units, FOB St. Louis, Michigan.

ARTICLE 4. EXAMINATION OF DOCUMENTS AND SITE

The Contractor agrees that before making his proposal he carefully examined the Contract Documents, together with the site of the

proposed work, as well as its surrounding territory, and is fully informed regarding all of the conditions affecting the work to be done and labor and materials to be furnished for the completion of this Contract, including the existence of structures of municipal and other public service corporations on, over or under the site, and that his information was secured by personal investigation and research and not from the estimates or records of Velsicol Chemical Corporation, and that he will make no claim against the Owner by reason of estimates, tests or representations of any officer or agent of the Owner. When used in the Contract Documents, the term site shall refer to the lands owned by Velsicol Chemical Corporation on which the former chemical plant was located in St. Louis Michigan.

ARTICLE 5 DATE OF COMMENCEMENT

The Contractor further agrees that he will begin the work herein embraced within seven (7) days of the effective date hereof, unless the consent of the Owner, in writing, is given to begin at a later date.

ARTICLE 6 ALTERATIONS AND OMISSIONS

The said work shall be performed in accordance with the true intent and meaning of the Contract Documents without any further expense of any nature whatsoever to the Owner other than the consideration named in this Agreement.

The Owner reserves the right, at any time during the progress of the work, to alter the Plans or omit any portion of the work as it may deem reasonably necessary; making allowances for additions and deductions at the prices named in the proposal, for this work without constituting grounds for any claim by the Contractor for allowance for damages or for loss of anticipated profits, or for any variations between the approximate quantities and the quantities of the work as done.

ARTICLE 7 NO COLLUSION OR FRAUD

The Contractor hereby agrees that the only person or persons interested as principal or principals in the Bid or proposal submitted by the Contractor for this Contract are named therein, and that no person other than those mentioned therein has any interest in the above-mentioned proposal or in securing the award, and that this Contract has been secured without any connection with any person or persons other than those named, and that the proposal is in all respects fair and was prepared and the Contract was secured without collusion or fraud and that neither any officer nor employee of Velsicol Chemical Corporation has or shall have a financial interest in the performance of the Contract or in the supplies, work or business to which it relates, or in any portion of the profits thereof.

ARTICLE 8 PAYMENT OF ESTIMATES

As the work progresses in accordance with the Contract and in a manner that is satisfactory to the Owner, the Owner hereby agrees to make payment to the Contractor therefor, based upon the proposal attached hereto and made a part hereof, as follows: The Owner shall once in each month and on such days as it may fix, make an estimate of the quantity of work done and of material which has actually been put in place in accordance with the terms and conditions of the Contract, during the preceding month, and compute the value thereof and pay to the Contractor the moneys due within 30 days of certification of the progress certificate by the Engineer. No monthly estimate shall be rendered unless the value of the work done equals five (5) percent of the Contract amount or \$1,000.00, whichever is lesser. The Owner shall retain ten per cent (10%), until the date of substantial completion, of all payments due the Contractor under this Contract. The Owner may, at any time after 50 percent of the work has been completed, if he finds that satisfactory progress is being made, reduce the total amount retained from progress payments to an amount not less than 5 percent of the total contract amount.

No payment shall be made to the Contractor hereunder unless Contractor shall have delivered to Owner, good and sufficient Contractors' and Sub-Contractors' sworn statements listing the names of all parties furnishing labor or materials, and the amounts due, or to become due to each; and unless Contractor shall have delivered to Owner good and valid waivers of lien of every party supplying labor and materials in the amount of all prior payments to such party.

All such sworn statements and waivers of lien shall comply with the Mechanics Lien laws of the State of Michigan and shall be in a form satisfactory to the Owner and Engineer.

ARTICLE 9 NO ESTIMATE ON CONTRACTOR'S NON-COMPLIANCE

It is further agreed that so long as any lawful or proper direction concerning the work or material given by Velsicol Chemical Corporation, or its representative, shall remain uncomplied with, the Contractor shall not be entitled to have any estimate made for the purpose of payment, nor shall any estimate be rendered on account of work done or material furnished until such lawful or proper direction aforesaid has been fully and satisfactorily complied with.

ARTICLE 10 SUBSTANTIAL COMPLETION

When the work or major portions thereof as contemplated by the terms of the Contract are, in the opinion of the Engineer, substantially complete, the Contractor shall submit to the Owner a requisition for payment of the remaining amount of the Contract balance. The Owner agrees to pay to the Contractor the remaining Contract balance less two times the estimated value of work items remaining to be completed, and an amount necessary to satisfy any claims, or judgements against the Contractor which have not been suitably discharged.

The Engineer shall be the sole judge as to the scope and value of uncompleted work items.

The amount of retention held by the Owner following substantial completion will not be less than five (5) per cent of the Contract value.

ARTICLE 11 PRELIMINARY ACCEPTANCE OF WORK

When in the opinion of the Engineer representing Velsicol Chemical Corporation the Contractor has fully performed the work under the Contract, the Engineer shall recommend to Velsicol Chemical Corporation the preliminary acceptance of the work so completed. If Velsicol Chemical Corporation accepts the recommendation of the Engineer, it shall thereupon by letter notify the Contractor of such preliminary acceptance, and copies of such acceptance shall be sent to other interested parties.

After preliminary acceptance of the work, the Engineer shall prepare an Agreement of work done from actual measurements and computations relating to the same, and he shall compute the value of such work under and according to the terms of the Contract. This Agreement shall be certified as to its correctness by the Engineer and submitted to Velsicol Chemical Corporation for approval. The right, however, is hereby reserved to Velsicol Chemical Corporation to reject the whole or any portion of the Agreement, should the said Certificate of the Engineer be found or known to be inconsistent with the terms of the Agreement or otherwise improperly given. All Certificates upon which partial payments may have been made being merely estimates, shall be subject to correction in the Final Certificate or Final Agreement.

Following acceptance by Velsicol Chemical Corporation of the Agreement of work done, prepared by the Engineer, the Owner will pay to the Contractor the full value of the Contract less two (2) per cent of the Contract value, the two (2) per cent being retained by the Owner until Final Acceptance.

ARTICLE 12 FINAL ACCEPTANCE AND PAYMENT

Prior to Final Acceptance of the Project and expiration of the Guarantee Period, the Engineer and Contractor shall perform a joint Final Inspection of the completed works. The Engineer will then prepare a schedule of deficient or inadequate work. The Contractor will promptly repair or replace all deficient work so listed to the satisfaction of the Engineer. Following completion of repairs, the Engineer will prepare a Final Certificate which shall:

- a) detail the final value of the Contract
- b) certify that all work performed is in accordance with the Terms and Conditions of the Contract

This Certificate shall be submitted to Velsicol Chemical Corporation for approval. The right, however, is hereby reserved to Velsicol Chemical Corporation to reject the whole or any portion of the Final Certificate, should the said certificate of the Engineer be found or known to be inconsistent with the terms of the Agreement or otherwise improperly given. All Certificates upon which partial payments may have been made being merely estimates, shall be subject to correction in the Final Certificate.

Final payment will be made by the Owner to the Contractor within sixty (60) days of the Owners approval of the Final Certificate.

ARTICLE 13 TAXES

The Contractor's prices set forth hereof does include sales, use, excise or similar taxes. Contractor agrees to provide proof of payment of sales tax at the time of invoice for all items covered by the invoice. Said proof is a condition precedent to Velsicol's obligation to pay.

ARTICLE 14 RIGHT TO SUSPEND WORK AND CANCEL CONTRACT

It is further agreed that if at any time during the prosecution of the work Velsicol Chemical Corporation shall determine that the work upon the Contract is not being performed according to the Contract or for the best interest of the Owner, the execution of the work by the Contractor may be temporarily suspended by Velsicol Chemical Corporation, who may then proceed with the work under its own direction in such manner as will accord with the Contract Specifications and be for the best interests of the Owner; or he may terminate the Contractor's employment under the Contract while it is in progress, and thereupon proceed with the work, in affirmance of the Contract, by Contract negotiated or publicly let, by the use of his own forces, by calling upon the surety to complete the work in accordance with the Plans and Specifications or by a combination of any such methods; or he may cancel the Contract and either readvertise and relet, or complete the work under his own direction in such manner as will accord with the Contract Specifications and be for the interests of the Owner; any excess in the cost of completing the Contract beyond the price for which it was originally awarded shall be charged to and paid by the Contractor failing to perform the work or his surety.

Whenever the Owner or the Engineer determines to suspend or stop work under the Contract, a written notice sent by mail to the Contractor at his address and to the sureties at their respective addresses, shall be sufficient notice of its action in the premises.

ARTICLE 15 DETERMINATION AS TO VARIANCES

In case of any ambiguity in the Plans, Specifications or maps, or between any of them, the matter must be immediately submitted to the Engineer, who shall adjust the same, and his decision in relation thereto shall be final and conclusive upon the parties.

ARTICLE 16 REMOVAL OF REJECTED WORK AND MATERIAL

The Contractor agrees that all work or material which may be rejected by the Owner or its representative shall be at once removed from the site of the work by the Contractor at his own expense, and replaced by work or material satisfactory to the Owner.

ARTICLE 17 SUCCESSORS AND ASSIGNS

This agreement shall bind the successors, assigns, and representatives of the parties hereto.

ARTICLE 18 PATENTS

- a) With regard only to equipment independently designed or manufactured by the Contractor, the Contractor shall defend and hold the Owner harmless from all costs, damages and expenses of litigation arising from infringement or claim of infringement of existing U. S. patents relating to such equipment or the use thereof by the Owner.
- b) With regard to equipment purchased by the Contractor for installation in the project, the Contractor shall secure from manufacturers, vendors and Subcontractors for such equipment the following hold harmless clause:

Seller shall defend and hold Buyer and Buyer's customer harmless from liability of every nature, including costs and expenses, for or on account of Seller's manufacture, sale or use of any patented or unpatented invention, article or appliance in the course of Seller's performance hereunder, the use and sale thereof by Buyer and the use thereof by use of any patented or unpatented invention, article or appliance in the course of Seller's performance hereunder, the use and sale thereof by Buyer and the use thereof by Buyer's customer; provided, however, that the foregoing provisions shall not extend to infringement to the extent that such infringement results from compliance with designs or drawings originating with Buyer or Buyer's customer.

- c) Should the Owner authorize the Contractor to purchase or design equipment in accordance with specifications provided by Owner, the Owner shall defend and hold the Contractor harmless from all costs, expenses and damages arising from infringement or claim of

infringement of existing U. S. patents with respect to such equipment brought against the contractor.

- d) The Owner shall defend and hold the Contractor harmless from all costs, expenses and damages arising from infringement or claim of infringement of any existing U. S. patents by any process to be embodied in the project based upon information supplied by the Owner.
- e) The obligations with respect to defense and hold harmless as contained in this Article shall be conditioned upon the party to be defended or held harmless giving prompt notification of any claim of infringement and on the cooperation of such party in the defense of any infringement claim brought against the other.

ARTICLE 19 HOLD HARMLESS

- a) Contractor agrees to indemnify and hold harmless Owner, its agents officers and employees against all claims, suits, judgements and costs for injury or destruction of property or persons including death (including without limitation amounts paid pursuant to investigations or settlements and as counsel fees) in consequence of any claim by a third party against Owner, including without limitation any claim by an employee of Owner, Contractor or its Subcontractor and any claim by employees of another contractor or its subcontractor whether filed before or after payment, based on actual or alleged damage to or destruction of property or injury to persons caused by Contractor or any of his Subcontractors or by their respective employees in connection with the work.
- b) Contractor agrees to hold harmless and indemnify Owner for all claims, suits, judgements, settlements or costs for personal injuries to Contractor's employees or its Subcontractors' employees while on Owner's premises unless caused by Owner's sole negligence.
- c) Contractor agrees to hold harmless and indemnify Owner for all claims, suits, judgments, settlements or costs resulting from Contractors breach of any covenant, term or condition contained in this Agreement , including the General and Special Conditions attached hereto.

ARTICLE 20 WAIVER

The failure of either party to insist in one or more instances upon the terms of the Contract, or to exercise any right hereunder, shall not be construed as a waiver of the future performance of any such term or the future exercise of such right, and the obligation of each party with respect to such future performances shall continue in full force and effect.

ARTICLE 21 LIENS

The Contractor shall, without cost to the Owner, obtain by bonding or otherwise, the prompt discharge of any lien or liens which may be filed in connection with the work hereunder. Neither the final payment nor any part of the retained percentage shall become due until the Contractor shall have delivered to the Owner a complete release of all liens arising or which may arise out of this Contract or receipts in full in lieu thereof, and, in either case, an affidavit of the chief financial officer of the Contractor stating that the releases and receipts include all the labor and material for which a lien could be filed; but the Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may pay in discharging a lien, including all costs and reasonable attorneys' fees.

ARTICLE 22 INDEPENDENT CONTRACTOR

The Contractor, in accordance with its status as an independent contractor, covenants and agrees that it will conduct itself consistent with such status, that it will neither hold itself out as, nor claim to be an officer or employee of the Velsicol Chemical Corporation by reason hereof and that it will not, by reason hereof, make any claim, demand or application to or for any right or privilege applicable to an officer or employee of Velsicol Chemical Corporation, including but not limited to Workmen's Compensation coverage, Unemployment Insurance Benefits, Social Security coverage or Retirement membership or credit.

IN WITNESS WHEREOF:

The parties hereto executed this Agreement the day and year first written.

VELSICOL CHEMICAL CORPORATION

CONTRACTOR

BY _____

BY _____

TITLE

TITLE

WITNESS _____

WITNESS _____

PERFORMANCE BOND

1. KNOW ALL MEN BY THESE PRESENTS, that we (hereinafter called the "Principal")

_____ of _____
_____ of _____
_____ of _____
_____ of _____
and _____ of _____

(hereinafter called the "Surety") are held and firmly bound unto Velsicol Chemical Corporation in the full and just sum of _____ Dollars (\$ _____) good and lawful money of the United States of America, to the payment of which said sum of money, well and truly to be made and done, the said Principal binds himself, his heirs, executors, administrators or assignees and the said SURETY binds itself, its successors or assigns, joints and severally, firmly by these presents.

2. SIGNED, SEALED AND DATED this _____ day of _____, 19____,

3. WHEREAS, said Principal has entered into a certain written Contract bearing date on the _____ day of _____, 19____, with Velsicol Chemical Corporation for the Securement of Plant Site, Phase II, St. Louis, Michigan.

Now, therefore, THE CONDITION OF THIS OBLIGATION IS SUCH that if the said Principal shall well, truly and faithfully perform the work in accordance with the terms of the Contract, and with the Plans and Specifications, and will commence and complete the work within the time prescribed in the Contract, on part to be kept and performed according to the terms and tenor of said Contract, and shall protect the said Velsicol Chemical Corporation against, and pay any excess of cost as provided in said Contract, and all amounts, damages, costs, and judgments which may be recovered against said State or its officers or agents or which Velsicol Chemical Corporation may be called upon to pay to any person or corporation by reason of any damages, direct or indirect, arising or growing out of the doing of said work, or from the negligence, nonfeasance, misfeasance or malfeasance of any office, agent or employee of Velsicol Chemical Corporation thereof, or suffered or claimed on account of said construction of the project during the time thereof and until the final completion and acceptance of the work, or the manner of doing same, or the neglect of the said Principal, or

his agents, or servants, or the improper performance of the said work by the said Principal, or his agents, or servants, or from any other cause, then this obligation shall be null and void, otherwise to remain in full force and virtue.

The Surety hereto agrees that in case the said Contract is forfeited by the Principal hereto in the manner provided in the Contract and the Principal fails to deposit to the credit of Velsicol Chemical Corporation the excess cost of completing the work occasioned by the failure of the Contractor, then and in that case the Surety will within ten (10) days from the date of notice by Velsicol Chemical Corporation of the amount of such excess cost deposit to the credit of said Department such sum of money as the said Department certifies to the Surety as being the excess above the funds remaining available for this Contract, free from all liens and incumbrances in the hands of Velsicol Chemical Corporation.

And the said SURETY hereby stipulates and agrees that no changes, extension, alteration, deduction or addition in or to the terms of the said Contract or the Plans or Specifications accompanying the same, shall in any way affect the obligations of said SURETY of his bond.

CORPORATE SEAL OF PRINCIPAL
IF A CORPORATION

CORPORATE SEAL OF SURETY

L. S.

L. S.

L. S.

L. S.

L. S.

(Acknowledgment by Principal, if a corporation)

VELSICOL CHEMICAL CORPORATION)
) ss. :
COUNTY OF _____)

On this _____ day of _____, 19____, before me personally
came _____ to me known, who being duly sworn,
did depose and say that he resides in _____
that he is the _____ of the _____
the corporation described in and which executed the foregoing instrument; that
he knew the seal of said corporation; that the seal affixed to said instrument
was such corporate seal; that it was so affixed by order of the Board of
Directors of said corporation, and that he signed his name thereto by like order.

(Seal)

Notary Public

(Acknowledgment by Surety Company)

VELSICOL CHEMICAL CORPORATION)
) ss. :
COUNTY OF _____)

On this _____ day of _____, 19____, before me personally
came _____ to me known, who being duly sworn,
did depose and say that he resides in _____
that he is the _____ of the _____
the corporation described in and which executed the foregoing instrument; that he
knew the seal of said corporation; that the seal affixed to said instrument was
such corporate seal; that it was so affixed by order of the Board of Directors of
said corporation, and that he signed his name thereto by like order.

(Seal)

Notary Public

(The Surety Company must append statement of its financial condition and a copy
of the resolution authorizing the execution of Bonds by officers of the Company)

VELSICOL CHEMICAL CORPORATION

I hereby approve the foregoing Contract and bond as to form and manner of execution.

DATED _____

Corporate Counsel

VELSICOL CHEMICAL CORPORATION

I hereby approve the foregoing Contract and bond.

DATED _____

Vice President
Health and Regulatory Affairs

LIST OF SUB-CONTRACTORS

The following is a list of Sub-contractors or Sub-trades together with a description of the items showing the portion of the work to be undertaken by each.

	NAME	ADDRESS	ITEM DESCRIPTION
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____

The employment of Sub-contractors or Sub-trades other than those listed above will not be permitted without written approval from the Engineer. Information indicating how the Sub-contractors or Sub-trades listed above qualify in experience and background required of the Contractor in accordance with this Document shall be requested by the Engineer before award of the Contract.

DATED THIS _____ DAY OF _____, 19__

Signature of Witness

Signature of Authorized Person
signing for Contractor

GENERAL CONDITIONS

Gc. 01 DEFINITIONS

i) Contract

"Contract" means the Contract to do the work, the Bonds or Securities, the Addenda (if any), the Specifications, the General and Special Conditions, the Bidding Information, the List of Contract Documents, the Drawings, and all other documents referred to or connected with the agreement.

ii) Owner

"Owner" means Velsicol Chemical Corporation.

iii) Contractor

"Contractor" means the person or corporation to whom the Contract for the work has been awarded.

iv) Subcontractor

"Subcontractor" means the person or corporation having a contract with the Contractor (or with another subcontractor) for the execution of a part or parts of the work included in the Contract, or for the supplying of material for the Contract and worked to a special design according to the Plans and Specifications.

v) Engineer

"Engineer" means Conestoga-Rovers & Associates Limited and their duly authorized agents.

vi) Work

"Work" means all labor, materials and other things required to be done, that are shown, described or implied in the Contract Documents, and includes all extra and additional work and material that may be ordered by the Engineer.

vii) Contract Price

"Contract price", wherever and in whatever manner used, means either the total lump sum Bid of the Contractor or the total of the unit price Bids of the Contractor extended, based upon the estimated quantities set forth in the proposal, or combinations thereof, plus or minus any adjustments made in accordance with the Contract.

viii) Day

"Day" means a calendar day of 24 hours.

ix) Person

"Person" includes firms, companies and corporations.

x) Contract Drawings

"Contract Drawings" or "Drawings" means and includes (a) all Drawings which have been prepared on behalf of the Owner and which are included as part of the Contract Documents and all modifying Drawings issued by addenda thereto; (b) all Drawings submitted pursuant to the terms of the Contract by the Contractor with his proposal and by the Contractor to the Owner during the progress of work when accepted by the Engineer; and (c) all Drawings submitted by the Engineer to the Contractor during the progress of the work.

xi) Contractor's Plant and Equipment

"Contractor's plant and equipment" means everything, except labor, brought onto the site by the Contractor in order to carry out the work, but not to be incorporated in the work.

xii) Shown

"Shown", "indicated", "detailed", and words of like import, wherever and in whatever manner used, with or without reference to the Drawings, means shown, indicated or detailed on the Drawings.

xiii) Sufficient

"Sufficient", "necessary", or "proper", "acceptable", "satisfactory", "desirable", and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means sufficient, necessary, proper, acceptable, satisfactory and desirable in the judgment of the Engineer.

xiv) Directed

"Directed", "designated", "permitted", "required", "accepted", and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means as directed, designated, permitted, required, and accepted by the Engineer.

xv) Specified

"Specified", "described", or "noted", wherever and in whatever manner used, means as specified, described or noted in the Contract Documents.

xvi) Submitted

"Submitted", wherever and in whatever manner used, means submitted to the Engineer for his acceptance.

xvii) Provide

"Provide", wherever and in whatever manner used, shall be understood to mean provide complete in place; that is, furnish and install.

xviii) Shall or Will

"Shall" or "will", whenever used to stipulate anything, means shall or will be done or be performed by either the Contractor or Velsicol Chemical Corporation and means that the Contractor or Velsicol Chemical Corporation has thereby entered into a covenant with the other party to do or perform the same.

xix) May

"May", wherever and in whatever manner used, is permissive.

xx) Herein

"Herein", "hereinafter" and words of similar import shall refer to the Contract Documents.

xxi) Supply

"Supply", wherever and in whatever manner used means Contractor supplies, F.O.B. the site.

xxii) Progress Payment (also known as Estimate for Payment)

"Progress Payment" and "Estimate for Payment" and like terms shall be one and the same and refer to the method of monthly payments to the Contractor in accordance with the terms of the Contract.

xxiii) Safety Officer

The Contractor's employee responsible for the implementation and enforcement of the Project Health and Safety Plan. The Safety Officer shall have a minimum of two years working experience in the chemical industry or chemical waste disposal industry or shall be a registered industrial hygienist with two years related experience. The Safety Officer shall have a sound working knowledge of state and federal occupational safety and health regulations and formal educational training in occupational safety and health.

sub-contractors. Any such offer shall be made in writing to the Engineer for his consideration at least 2 weeks in advance of the time at which the Contractor wishes to order the material or equipment for use in the work, and the Contractor shall include with his offer sufficient data which, together with any other data the Engineer may require, will enable the Engineer to assess the acceptability of the material or equipment. When the substitute equipment or material necessitates changes to or coordination with any other portion of the work, the data submitted shall include drawings and details showing all such changes, and the Contractor shall perform these changes as part of any acceptance of his offer by the Engineer. Such acceptance by the Engineer shall not relieve the Contractor from full responsibility for the efficiency, sufficiency, and quality and performance of the substitute material or equipment, in the same manner and degree as the material and equipment specified by name.

Gc. 18 THE ENGINEER

- a) The Engineer will make such decisions as are necessary with respect to:
- i) Discrepancies in the Contract Documents, or
 - ii) Differences of opinion or misunderstanding that may arise as to the meaning of the Contract, or
 - iii) Omissions or misstatements in the Contract Documents, or
 - iv) Quality, dimensions and sufficiency of plant, materials, or work, or
 - v) The due and proper execution of the work, or
 - vi) The measurement, quantity or valuation of the work, including additional work and deductions, or
 - vii) Any other questions or matters arising out of the Contract.

The Engineer's decision as to any matter referred to in this clause shall be binding upon the parties concerned.

- b) The Engineer may at all reasonable times visit, enter and make inspections at any building, factory, workshop, work or site whenever materials are being prepared, made or treated, or where work is being done in connection with the Contract. The Engineer may also take such samples as he may consider necessary.
- c) When the Engineer makes a decision under this clause, the Contractor shall immediately proceed with all work affected by the decision. Additions to or deductions from the Contract price shall be made only provided for in the Contract, and no revisions to the completion time shall be made, unless approved by the Engineer.

Gc. 19 COLD WEATHER

When work is permitted or ordered by the Engineer to be done in cold weather, the Contractor shall provide suitable means for heating and protection, and all the materials shall be heated and protected. Unless the Engineer directs otherwise, all work such as masonry, concrete and painting that may be injured by frost, and which cannot be satisfactorily completed, shall be put in a proper and satisfactory condition, and shall be protected from damage by frost. The cost of such protection shall be borne by the Contractor.

Gc. 20 OWNERSHIP OF DOCUMENTS

All Contract Documents, including all Drawings, Specifications, models and similar items supplied by the Engineer are his property. Such Documents are not to be used on other work and, with the exception of the signed Contract Documents, shall be returned by the Contractor to the Engineer on the completion of the work. This section refers to all copies or reproductions as well as original material.

Gc. 21 DETAILS AND INSTRUCTIONS

- a) The Contractor shall not deviate from or in any way alter the Contract Documents without the written authority of the Engineer. Any ambiguities, omissions or discrepancies that may arise will be explained and adjusted by the Engineer, who may issue to the Contractor instructions directing the manner of performing the work.
- b) If necessary for the proper execution of the work, the Engineer may issue additional instructions, as drawings or otherwise, and all such instructions shall become parts of the Contract. The work shall be executed in conformity with such instructions, and the Contractor shall do no additional work without such instructions.
- c) The Contractor shall perform and observe the provisions of the Contract and carry out the written directions of the Engineer. Should the Contractor refuse or neglect to carry out the written instructions of the Engineer within seven (7) days, the Engineer may
 - i) take such steps (including the procuring of plant, labor and material) and do such work as he may consider advisable, or
 - ii) at the option of the Owner, exercise the powers specified in Gc. 34.

The cost so incurred may be deducted or collected under the provisions of the Contract, and any such action taken by the Engineer shall not relieve the Contractor from any liability under the Contract.

Gc. 22 LIABILITY

The Contractor shall assume the defence of and shall indemnify and save harmless the Owner from all claims unless specified otherwise:

- a) resulting from the prosecution of the work, or
- b) resulting from any of the Contractor's operations, or
- c) caused by reason of any material, plant or labor used in the work, or
- d) arising from any act of commission or omission on the part of the Contractor, or
- e) relating to inventions, copyrights, trademarks, patents (and rights to them) used in doing the work, or in the use and operation of work on completion, unless otherwise specified.

Gc. 23 LIABILITY INSURANCE

The Contractor shall, at his expense, insure and maintain insurance against liability for bodily injury and property damage that may arise with respect to the work being performed under the Contract. Such insurance shall:

- a) be in the joint names of the Owner, the Contractor, the Sub-contractors, the Engineer and the Municipality.
- b) have inclusive limits of liability as set forth in the Special Conditions, Clause Sc. 13.
- c) include coverage for:
 - i) Contractual liability, and
 - ii) Cross liability, and
 - iii) Contingent Employer's liability, and
 - iv) Completed Operations liability, and
 - v) Property in care, custody, and control of Contractor
 - vi) Explosion, collapse or underground fault
- d) remain in force for 60 days following the issue by the Engineer of the Final Payment Certificate.

Gc. 24 VEHICLE INSURANCE

The Contractor shall, at his expense, insure and maintain insurance against liability for bodily injury and property damage caused by vehicles owned by the Contractor and used on the work. The Contractor shall also, at his expense, insure and maintain insurance against liability for bodily injury and property damage caused by vehicles not owned by the Contractor and used on the work. Such insurance shall each have an inclusive limit at least equal to \$3,000,000.00.

Gc. 25 INSURANCE POLICIES AND CERTIFICATES

- a) When the successful Bidder is notified that his Bid has been accepted he shall deposit with the Owner.
 - i) either copies of liability and vehicle insurances, or insurance certificates indicating compliance with Clauses Gc. 23 and Gc. 24.
- b) Insurance policies shall stay in force and not be amended, cancelled or allowed to lapse without thirty (30) days' prior notice.
- c) The Contractor shall deposit certificates with the Owner indicating that the Contractor has paid assessments under the Workmen's Compensation Act as provided in Clause Gc. 26. Such certificates shall be deposited:
 - i) at the time of award of the Contract, and
 - ii) at intervals of six months during the course of the Contract, and
 - iii) prior to the issue of the Final Certificate.

Gc. 26 WORKMEN'S COMPENSATION

The Contractor and his sub-contractors shall maintain Workmen's Compensation Insurance in the amount and type required by law for all employees employed under this Contract who may come within the protection of Workmen's Compensation Laws. In jurisdictions not providing complete Workmen's Compensation protection, the Contractor and his sub-contractors shall maintain employer's general liability insurance in an amount, form, company and agency satisfactory to the State for the benefit of all employees not protected by Workmen's Compensation Laws.

The Contractor shall pay such assessments as will protect him and the Owner from claims under the Workmen's Compensation Laws.

Gc. 27 LOSS OR DAMAGE

The Owner shall not be answerable or accountable for loss or damage by fire or otherwise of the work, or part of the work, or for any material, equipment, or similar items to be incorporated into the work.

The Contractor shall properly guard the works and make good all loss or damage of whatever nature or origin that may arise out of the Contract, until the work is complete as indicated by the issue by The Engineer of the Acceptance Certificate.

Gc. 28 HOURS OF WORK

The Engineer may prohibit the Contractor from carrying on operations during any hour or hours of the day in which the Engineer, in his judgment, deems such operations to be a disturbance or nuisance to the public or to be detrimental to the interest of the Owner.

Such prohibition may be made notwithstanding any prior consent, order, agreement or requirement in the Contract that stipulates maximum or minimum hours of work.

Gc. 29 PAYMENTS TO THE CONTRACTOR AND SUB-CONTRACTORS

Payment to the Contractor and Sub-contractors shall be made as follows:

1. Payment by Owner to Contractor

The Contractor shall periodically, in accordance with the terms of the Contract, submit to the Owner and/or his agent a requisition for a progress payment for the work performed and/or materials furnished to the date of the requisition less any amount previously paid to the Contractor. The Owner shall in accordance with the terms of the Contract approve and promptly pay the requisition for the progress payment less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged and less any retained amount as hereafter described. The Owner shall retain not more than ten (10) percentum of each progress payment to the Contractor. The Owner shall pay, upon requisition from the Contractor, for materials pertinent to the project which have been delivered to the site or off-site by the Contractor and/or Subcontractor and suitably stored and secured as required by the Owner and the Contractor provided, the Owner may limit such payment to materials in short and/or critical supply and materials specially fabricated for the project each as defined in the Contract. When the work or major portions thereof as contemplated by the terms of the Contract are substantially completed, the Contractor shall submit to the Owner and/or his agent a requisition for payment of the remaining amount of the Contract balance. Upon receipt of such requisition the Owner shall approve and promptly pay the remaining amount of the Contract balance less two (2) times the value of any remaining items to be completed and an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. As the remaining items of work are satisfactorily completed or corrected, the Owner shall promptly pay, upon receipt of a requisition, for these items less an amount necessary to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. Any claims, liens and judgments referred to in this section shall pertain to the project and shall be filed in accordance with the terms of the applicable Contract and/or applicable law.

2. Payment by Contractor to Subcontractors

Within fifteen (15) calendar days of the receipt of any payment from the Owner, the Contractor shall pay each of his subcontractors and material men the proceeds from the payment representing the value of the work performed and/or materials furnished by the subcontractor and/or materialman as reflected in the payment from the Owner less any amount necessary to satisfy any claims, liens or judgments against the subcontractor or materialman which have not been suitably discharged and less any retained amount as hereafter described. The Contractor shall retain not more than ten (10) per centum of each payment to the subcontractor and/or materialman. However, the Contractor shall retain nothing from those payments representing proceeds owed the subcontractor and/or materialman from the Owner's payments to the Contractor for the remaining amounts of the Contract balance as provided in subdivision of this section. Within fifteen (15) calendar days of the receipt of payment from the Contractor, the subcontractor and/or materialman shall pay each of his subcontractors and materialmen in the same manner as the Contractor has paid the subcontractor. Nothing provided herein shall create any obligation on the part of the Owner to pay or to see to the payment of any moneys to any subcontractor or materialman from any Contractor nor shall anything provided herein serve to create any relationship in contract or otherwise, implied or expressed, between the subcontractor or materialman and the Owner.

Gc. 30 PROGRESS CERTIFICATE

The Contractor shall be entitled to receive partial payments upon the certificate of the Engineer of the value of work done and materials supplied.

For Progress Certificates, the Engineer's decision as to the estimated value of completed work and materials supplied shall be final, but shall not be binding on him, the Contractor or the Owner in the estimating of the final value of the work, nor shall it be taken as evidence as to the ownership of, or payment for the work.

Gc. 31 FINAL ACCEPTANCE CERTIFICATE

- a) When the work required to be done under the Contract has been completed in every respect and is acceptable to the Engineer, a final valuation of the Contract will be prepared by the Contractor and the Engineer.
- b) The Contractor shall submit to the Engineer a statement indicating the Contractor's valuation of the work according to records available to the Contractor. The Engineer will review this statement and either approve it or submit detailed reasons for revisions that, in his opinion, should be made.

- c) Should the Engineer consider it advisable, the Engineer will prepare a final valuation of the work and submit it to the Contractor who shall either approve it or submit detailed reasons for revisions that, in his opinion, should be made.
- d) When the Engineer and Contractor have reached agreement as to the final value of the work, the Engineer will issue an Acceptance Certificate, detailing the valuation of the Contract, and certifying its acceptance at a certain specific date, referred to as the "acceptance date".
- e) Should the Engineer and Contractor be unable to reach agreement as to the final value of the work within a reasonable period, the Engineer will issue his Acceptance Certificate detailing his valuation of the Contract and certifying acceptance of the work at a certain specific date, referred to as the "acceptance date".

Gc. 32 FINAL PAYMENT CERTIFICATE AND RELEASE OF HOLDBACKS

Provided all the provisions of the Contract have been fully met, the Engineer will issue a Final Payment Certificate upon final acceptance. The Final Payment Certificate will entitle the Contractor to receive the full amount due under the Contract. Holdbacks held under the provisions of Clause Gc. 29 shall be released as recommended in the Final Payment Certificate only after the Contractor has provided a properly completed Statutory Declaration indicating that no moneys, claims, liens, or judgments against the Contractor relative to this Contract has been received by the Engineer.

Gc. 33 VALUATION

- a) At monthly intervals, the Contractor and the Engineer shall make a valuation of the work constructed and material supplied under the Contract. Should the Engineer wish to measure any of the work or material, the Contractor shall assist in such measurements and furnish all particulars required.
- b) The monthly valuations described in subsection (a) above shall not bind the Owner, the Contractor or the Engineer to any final valuation of the work to be done under the Contract, but shall be construed as approximations only for the purpose of Progress Certificates.
- c) The final valuation of the work shall be prepared as soon as possible after the whole of the works has been completed.

Gc. 34 TERMINATION OF CONTRACT

- a) In addition to Owner's cancellation rights as set forth in Article 14 of the Agreement, the Owner may terminate the employment of the Contractor, if the Engineer certifies that sufficient cause exists to justify such action. Such termination of employment may be made:
- (i) if the Contractor should be adjudged a bankrupt, or
 - (ii) if he should make a general assignment for the benefit of his creditors, or
 - (iii) if a receiver should be appointed on account of his insolvency, or
 - (iv) if he should take the benefit of any Act relating to insolvent debtors, or
 - (v) if a winding up order be made against the Contractor, or
 - (vi) if he should refuse or fail to supply enough plant, properly skilled labor or proper materials after having received seven (7) days' notice in writing from the Engineer to do so, or
 - (vii) if he should fail to make prompt payment to subcontractors and suppliers, or
 - (viii) if he should persistently disregard laws, ordinances or the instructions of the Engineer, or
 - (ix) if he should otherwise be guilty of a substantial violation of the provisions of the Contract.
- b) Should the Owner terminate the employment of the Contractor, as provided in subsection (a) above, he shall give the Contractor seven (7) days' written notice of such termination of employment.
- c) Should the Owner terminate the employment of the Contractor, as provided in subsection (a) above, he may take possession of the premises and of all materials and plant on the premises, and may finish the work by any method he may deem expedient, but without undue delay or expense. In such case, the Contractor shall not receive any further payment until the work is completed.
- d) If the unpaid balance of the Contract price exceeds the expense of finishing the work (including compensation to the Engineer for his additional services), such excess shall be paid to the Contractor. If such expense exceeds the unpaid balance, the Contractor shall pay the difference to the Owner. The additional expense incurred by the Owner due to the Contractor's default shall be certified by the Engineer.
- e) If the work should be stopped by order of any court or public authority, for a period of 90 days or more through no act or fault of the Contractor, anyone employed by him, or any of his subcontractors, the Contractor, after ten (10) days written notice to the Owner, may terminate the Contract. Forthwith upon the termination of the Contract, the Engineer shall estimate all of the work done up to the time of such termination and the Contractor shall be entitled to and shall receive payment therefor in the manner provided in the Contract. In addition thereto, the Owner will pay to the Contractor in full and complete satisfaction and settlement for the Contractor's

inconvenience, loss of anticipated profits, cost of removing his equipment from the site and all other expenses whatsoever, ten (10) percent of the difference between the Engineer's estimate of the Contract price and the sum of the payments made to the Contractor for work done up to the date of the termination of Contract. The Contractor shall be entitled to no further payment whatsoever for the work.

For the purpose of this article, "all of the work done" includes all materials ordered by the Contractor prior to the date of receipt of such notice of termination, whether or not they have been delivered to the site of the work. The amount of payment for all such materials under this article shall be their actual necessary cost to the Contractor up to the date of receipt of such notice of termination. Upon the receipt of such notice of termination, all the Contractor's right, title and interest in and to the materials mentioned in this article shall be vested in the Owner, and the Contractor shall upon demand of the Owner execute and deliver to the Owner all requisite bills of sale, assignments and other documents of transfer that may be necessary to give effect to the intention of this article.

Gc. 35 STANDARD SPECIFICATIONS

Whenever a standard specification, code or recommended practice is referred to, it shall be the latest edition of that specification code or recommended practice and it shall be considered to be a part of the Contract Documents insofar as it applies. Standard specifications, codes, recommended practices and abbreviations used in the Contract Documents are listed in Section Sc. 14 of the Project Specifications.

Gc. 36 ASSIGNMENT

The Contractor shall not assign the Contract, or any part of it without the written consent of the Owner, nor shall the Contractor assign any moneys due, or to become due, to him without consent of the Owner.

SPECIAL CONDITIONS OF THE CONTRACT

Sc. 01 GENERAL

It is the intent of these Special Conditions to describe the miscellaneous work to be done and the materials to be used in the construction of services and all related work under this Contract and to amplify the Standard Specifications.

The Special Conditions are to be read in conjunction with and take precedence over the Standard Specifications and General Conditions.

Sc. 02 CONTRACTOR'S SCHEDULE FOR CONSTRUCTION

The Contractor shall submit to the Engineer a complete detailed construction schedule indicating the various elements of the construction procedure, equipment deliveries and installations and an indication of all areas of critical happenings which are for some reason flexible and which may alter the path and timing of the proposed schedule. The construction schedule shall be submitted to the Engineer for approval not more than one (1) week after the notification to the Contractor to commence work.

Sc. 03 PERMANENT RECORD

The Contractor shall keep a permanent record on the sites showing dates of commencement and completion of all trades and other work, daily weather conditions, excavations, backfilling, formwork, concrete work, and removal of forms. He shall keep in duplicate, daily records of the number of men engaged on the job and on each division of the work and make these available to the Engineer upon request.

Sc. 04 INCLEMENT WEATHER

The Contractor shall provide adequate protection and take caution at times of inclement weather. Inclement weather or extra work caused by such weather will not be accepted as reason for any additional payment.

Sc. 05 INSURANCE CLAIMS

Claims or alleged claims received by the Contractor shall be dealt with immediately by the Contractor and a copy sent to the Engineer. If a claim is settled to the satisfaction of the claimant, the Contractor shall submit a copy to the Engineer of the claimants release.

If a claim or alleged claim is rejected by the Contractor and/or his insurance company, the Contractor shall immediately report this fact to the Engineer.

Should thirty (30) days elapse after the claim or alleged claim has been received by the Contractor, and the Contractor is not able to report a settlement or rejection of the claim, he shall report to the Engineer the steps being taken with respect to the claim.

Sc. 06 PERFORMANCE AND PAYMENT BONDS

The successful Bidder must deliver to the Owner an executed Performance Bond in an amount at least equal to one hundred percent (100%) of the accepted Bid as security for the faithful performance of the Contract, and also must deliver to the Owner a separate executed Payment Bond in an amount at least equal to one hundred percent (100%) of the accepted Bid as security for the payment of all persons performing labor and furnishing materials in connection with this Contract. The sureties of all bonds shall be such surety company or companies as are approved by the Owner, and as are authorized to transact business in the State of Michigan. The bonds must be approved by the Owner prior to execution of the formal Contract, and shall remain in effect for ninety (90) days beyond the date of the Final Acceptance of the project.

Sc. 07 MAINTENANCE AND REPAIR BOND

The successful Bidder must deliver to the Gratiot County Road Commission an executed Maintenance and Repair Bond in an amount at least equal to \$50,000.00 as security for the maintenance and repair of all County Roadways used as haul roads during performance of the Contract. The sureties of this bond shall be such surety company or companies as are approved by the Owner, and as are authorized to transact business in the State of Michigan. The bond must be approved by the Owner prior to execution of the formal Contract and must remain in effect until final release is obtained by the Contractor from the Gratiot County Road Commission, following completion of the Contract.

Sc. 08 UTILITIES

The Contractor shall protect and support if necessary all utilities to maintain their operation. Any utilities which are damaged by the Contractor shall be immediately replaced, at the Contractor's expense.

Sc. 09 FAILURE TO COMPLETE WORK ON TIME AND LIQUIDATED DAMAGES

For each calendar day that any work shall remain uncompleted after the Contract date specified for the completion of the work provided for in the Contract, the amount of \$1,000.00 per calendar day will be deducted from any money due the Contractor, not as a penalty but as liquidated damages; provided however, that due account shall be taken of any adjustment of the Contract time for completion of the work as provided for elsewhere in the Specifications.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion or after the date to which

the time for completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the Contract.

The Owner may waive such portions of the liquidated damages as may accrue if he deems the work is in such condition as to be safe and convenient for use.

The assessing of liquidated damages shall be in addition to Engineering Charges as provided for in Sc. 11 of the Specifications.

Sc. 10 EXTENSION OF TIME

Delays which affect the scheduled completion date of the project and attributable to interference between contractors and utility owners, delays by railroad companies in progressing related work, special requirements or actions by municipalities, federal agencies and other public bodies not anticipated in the Contract Documents, and unusually severe storms of extended duration or impact shall be compensated solely by the granting of an extension of time by the Velsicol Chemical Corporation to complete the work of the Contract without engineering charges. Time necessary for reviews by the Owner or Engineer of shop drawings, for field changes to meet actual conditions, and delays incurred by seasonal and weather limitations should be anticipated and are neither compensatory nor eligible for extensions of time.

Where extra costs can be demonstrated relative to delays caused directly by acts of the Owner beyond the Contract requirements, such costs as are necessary may be reimbursable subject to the prompt substantiation of such costs by the Contractor via the initiation of procedures specified in Fb. 04 and Fb. 05. The substantiated necessary costs of such delays which may be considered for reimbursement shall be limited to orders by the Owner to stop work for reasons other than provided in the Contract Specifications and requirements and for the unavailability of right-of-way parcels for such an extended period beyond that indicated in the Contract Documents that the Contractor's progress on the Contract as a whole is significantly affected.

The Contractor agrees that he has included in his unit price Bid for the various items of the Contract the additional costs of doing the work under this Contract caused by not having a clear site for the work, by interference by other contractors and necessary utility work and by the other non-compensatory delays described above.

Sc. 11 ENGINEERING CHARGES

When the work embraced in the Contract is not completed on or before the date specified therein, engineering and inspection expenses incurred by the Owner upon the work from the completion date originally fixed in the Contract to the final date of completion of the work may be charged to the Contractor and may be deducted by the Owner from any moneys due the Contractor. Consideration of any extra work or order on the Contract added to the original Contract, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the Owner before assessing engineering and inspection charges against the Contractor. Such charges will be assessed, however, in cases where the work has been unduly delayed by the Contractor because of unwarranted reasons, inefficient operation, or for any other reason for which the Owner determines the Contractor liable.

Sc. 12 SAFETY AND SECURITY

The Contractor shall perform all work in the Contract in a workmanlike manner with due regard to the safety of the employees and of the public.

The Contractor shall submit with his bid a detailed health and safety plan that shall address the aspects of carrying out the construction work specified under potential exposure to hazardous chemical materials. Contractor agrees that the employees of Contractor and/or any subcontractor will be notified that in consideration of working on Velsicol's premises, each employee and his automobile shall be subject to search at any time while on, entering or leaving Velsicol's premises and each employee understands that promptly upon Velsicol's request, any employee may be requested to submit to a polygraph (lie detector) test regarding theft of property located on Velsicol's premises.

Sc. 13 INSURANCE

The Contractor shall procure and maintain at his own expense, and without expense to the Owner, until Final acceptance by the Owner of the work covered by the Contract, insurance for liability for damages imposed by law, of the kinds and in the amounts hereinafter provided by insurance companies authorized to do such business in the State and covering all operations under the Contract whether performed by him or by subcontractors. Before commencing the work the Contractor shall furnish to the Engineer a certificate or certificates of insurance in form satisfactory to the Engineer showing that he has complied with this paragraph, which certificate or certificates shall provide that the policies shall not be changed or cancelled until thirty (30) days written notice has been given to the Engineer. The types and limits of insurance are as follows:

A. Workmen's Compensation Insurance

A policy covering the obligations of the Contractor in accordance with the provisions of the Laws, as amended, known as the Workmen's Compensation Law, covering all operations under the Contract, whether performed by him or by his Subcontractor. The Contract shall be void and of no effect unless the person or corporation making or executing same shall secure compensation and disability benefits coverage for the benefit of and keep insured during the life of said Contract, such employees in compliance with the provisions of the Workmen's Compensation Law. Coverage under this section will not be less than \$100,000.00.

B. Liability and Property Damage Insurance

Unless otherwise specifically required by special specifications, each policy will have limits as shown hereafter:

<u>Employers Liability</u>	- \$200,000.00 each accident - Coverage B
<u>Contractor Comprehensive</u>	- General Liability (including Contractual, complete operations, and XCU coverage.)
Bodily Injury	- \$200,000.00 each person - \$500,000.00 each occurrence
Property Damage	- \$200,000.00 each occurrence (including operative, products, contractual)
<u>Automobile Liability</u>	
Bodily Injury	- \$100,000.00 each person - \$300,000.00 each occurrence
Property Damage	- \$100,000.00 each accident
<u>Umbrella Coverage</u>	- \$5,000,000.00 in excess of primary limits above

FOOTNOTE: The Contractor's attention is directed to the insurance limits required for the performance of work under this Contract and that these limits of coverage ARE NOT to be amended by deductible clauses of any nature without the expressed written consent of the Owner, or unless specifically provided for in these Specifications.

1. Contractor's Liability Insurance issued to and covering the liability for damages imposed by law upon the CONTRACTOR with respect to all work performed by him under the agreement;

2. Contractor's Liability Insurance issued to and covering the liability for damages imposed by law upon EACH SUBCONTRACTOR with respect to all work performed by said Subcontractor under the agreement;
3. Contractor's Protective Liability Insurance issued to and covering the liability for damages imposed by law upon the Contractor with respect to all work under the agreement performed for the Contractor by Subcontractors;
4. Protective Liability Insurance issued to and covering the liability for damages imposed by law upon Velsicol Chemical Corporation and the City of St. Louis and all employees and agents of the Velsicol Chemical Corporation and the City of St. Louis both officially and personally, with respect to all operations under the agreement by the Contractor or by his Subcontractors, including omissions and supervisory acts of the State;
5. Completed Operations' Liability Insurance issued to and covering the liability for damages imposed by law upon the Contractor and each Subcontractor arising out of that part of the work performed by each;
6. Owners', Landlords' and Tenants' Liability Insurance issued to and covering the liability for damages imposed by law upon Velsicol Chemical Corporation and the City of St. Louis and all employees and agents of the Velsicol Chemical Corporation and the City of St. Louis both officially and personally, with respect to temporarily opening to vehicular traffic any portion of the project under the agreement, until the construction pursuant to the agreement has received final acceptance by Velsicol Chemical Corporation.
7. Automotive Liability Insurance issued to and covering the liability for damages imposed by law upon the Contractor, his sub-contractor, Velsicol Chemical Corporation and the City of St. Louis, and all employees and agents of Velsicol Chemical Corporation and the City of St. Louis with respect to the operation and control of any and all vehicles owned, leased or otherwise employed by the Contractor or his sub-contractors during performance of work under the agreement.
8. All Risk Insurance to protect the Contractor from the hazard of damage to the work in progress. Such insurance shall be in the amount of the total Contract Bid or in the sum of One Million Dollars, (\$1,000,000.) whichever is the lesser, and shall contain a deductible feature not to exceed the sum of Five Hundred Dollars (\$500).

Sc.14 STANDARD SPECIFICATIONS

The following standard specifications may be referred to herein, and should be read in conjunction with the General Conditions, Section Gc.35.

Air Moving and Conditioning Association (AMC)
American Association of State Highway Officials (AASHO)
American Concrete Institute (ACI)
American Gas Association (AGA)
American Gear Manufacturer's Association (AGMA)
American Institute of Steel Construction (AISC)
American Iron and Steel Institute (AISI)
American National Standards Institute (ANSI)
American Petroleum Institute (API)
American Society for Testing and Materials (ASTM)
American Society of Civil Engineers (ASCE)
American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
American Society of Mechanical Engineers (ASME)
American Standard Safety Code for Elevators, Dumbwaiters and Escalators (ASE Code)
American Water Works Association (AWWA)
American Welding Society (AWS)
American Wood Preservers' Association (AWPA)
Anti-friction Bearing Manufacturers' Association (AFBMA)
Gratiot County Building Code
Gratiot County Electrical Code
Gratiot County Plumbing Code
Gratiot County Standard Plans and Specifications
Concrete Products Association of Washington (CPAW)
Diesel Engineer Manufacturers' Association (DEMA)
Edison Electric Institute (EEI)
Expansion Joint Manufacturers' Association (EJMA)
Federal Specifications (Fed. Spec.)
Illuminating Engineering Society (IES)
Institute of Electrical and Electronics Engineers, Inc. (IEEE)
Instrument Society of America (ISA)
Insulated Power Cable Engineers' Association (IPCEA)
Joint Industrial Council (JIC)
National Electric Safety Code (NESC)
National Electrical Code (NEC)
National Electrical Manufacturers' Association (NEMA)
National Fire Protection Association (NFPA)
National Lumber Manufacturers' Association (NLMA)
Occupational Safety and Health Act (OSHA)
Overhead Electrical Crane Institute (OECI)
Rental Rates for Construction Equipment (BLUE BOOK) by Associated Equipment Distributors
Tabular Exchanger Manufacturers' Association (TEMA)
Underwriters' Laboratories, Inc. (UL)
Uniform Building Code (UBC)
Applicable Environmental Standards

Sc.15 CONFIDENTIALITY

The Contractor shall not, without the prior consent of Velsicol, in each instance, describe to any third person any of the details or characteristics of the work and Contractor, its employees and representatives will hold in confidence and not use or reveal to others any proprietary Velsicol technology or other data which may come into its or their possession or knowledge in connection with the work.

Sc.16 LABOR RELATIONS

The Contractor shall use its best efforts to maintain satisfactory labor relations with organizations representing labor hired directly by Contractor and by any Subcontractor. Contractor will use its best efforts to promptly resolve disputes with the objective of reducing work stoppages to a minimum.

The Contractor shall immediately notify the Owner of the occurrence of any labor dispute, or of a threatened or actual stoppage, affecting employees of Contractor or of a Subcontractor.

Sc.17 IMPORTED FILL

Velsicol shall provide to the Contractor, without cost, topsoil and earthen fill lying in its natural state, at a location approximately 2.3 miles distant from the site of work. The location of the topsoil and fill source, as well as the haul routes to be used between the topsoil and fill source and the site of work are indicated on the Contract Drawings. The Contractor shall limit the travel of loaded trucks or heavy equipment to the roads indicated on this plan.

The Contractor shall at all times maintain Gratiot County and City of St. Louis owned roadways to the satisfaction of the Engineer and Owners. Following completion of haulage operations, the Contractor shall make all repairs necessary to restore County and City roadways to a condition no worse than existed prior to commencement of haulage operations.

Sc.18 ADJACENT LANDS

The Contractor shall limit his activities to within the boundaries of the Velsicol Plant Site. All damages to other privately owned lands and land owned by the City of St. Louis which are adjacent to the Plant Site shall be restored at the Contractor's expense to the satisfaction of the Engineer and the City of St. Louis.

Sc.19 GUARANTEE PERIOD

The guarantee period for the Contract shall be twelve (12) months, and shall commence at the date of Preliminary Acceptance.

For purposes of the downgradient wall the Contractor is requested to provide warranties regarding the quality of his workmanship and/or the long term performance of the completed containment wall. As a minimum the Contractor shall provide a warranty on workmanship and materials for fifteen (15) years.

Sc.20 MATERIALS TESTING

As further detailed in the Project Specifications, a representative from Velsicol and from the Michigan Department of Natural Resources will be present to collect samples for testing throughout the containment wall construction. The Contractor shall provide access and assistance as required to expedite the collection of soil samples.

Where required by the Engineer, the Contractor shall supply for testing, samples of all materials to be used in the construction, and shall not use any material until it has been approved. All testing will be done by a testing firm hired and approved by the Engineer, except as otherwise specified in the Contract Documents.

Sc.21 DEWATERING AND COLLECTION OF GROUNDWATER

It is emphasized that in the context of the Contract, groundwater collected from any phase of construction on the Plant Site shall be considered contaminated. All such collected liquids shall be transported to the Plant Site holding tank for subsequent deep well injection. On no account shall liquid from within excavated areas be discharged to watercourses or impoundments adjacent to the site of work.

Sc.22 ENTRY TO SITE

It is the responsibility of the Contractor to ensure that each and every employee, whether of the Contractor, or a subcontractor, or of an agent of the Contractor, be explicitly informed prior to entry to the site of work, that the site of work is over or adjacent to a location where hazardous waste has been disposed.

Sc.23 AMBIENT AIR MONITORING

Velsicol shall install and operate a total of six (6) ambient air monitors adjacent to the Plant Site. Total suspended particulate analysis shall be conducted on a daily basis. The data so obtained shall be utilized by the Engineer to monitor and revise, if necessary, the Contractor's dust control program. On a biweekly basis, filters shall also be analyzed for selected chemical contaminants.

The Contractor shall conduct his operations in such a manner that the air quality standards listed below are not violated.

Indicator Compounds - 150 nanograms/filter
(HBB, DDT, PBB, TRIS)

Total Suspended Particulates - 150 micrograms/cubic meter

Should one or more air monitors indicate exceedence of the Air Quality standards, the Contractor shall immediately revise his methods of operation and/or dust control techniques. All costs associated with complying with the secondary 24-hour particulate standard shall be borne by the Contractor.

Access to the two air sampling units, labelled P2 and P4 on the Contract Drawings, presently located along the Plant Site boundary, shall be maintained at all times during the Contractor's activities.

Sc.24 SEGREGATION OF WORK AREAS

For the purpose of this Contract, all areas within or enclosed by the Velsicol property fenceline, or the Contractor's temporary security fence, shall be considered contaminated. All personnel and equipment within these areas shall strictly conform to the provisions of the Project Health and Safety Plan. It is especially stressed that personnel access to the site will be allowed only through the personal hygiene facility at the northeast corner of the site.

Requests for relief from any provision of the Health and Safety Plan shall be submitted in writing by the Contractor to the Engineer. Approval, if granted, will be issued only in written form by the Engineer.

PROJECT SPECIFICATIONS

Ps. 1 PROJECT SPECIFICATIONS - GENERAL

Ps. 1.01 CONTRACTOR'S OFFICE

During the performance of the Contract, the Contractor shall provide and maintain a suitable office at the site of the work which shall be the headquarters of a representative of the Contractor.

Ps. 1.02 CONTRACTOR'S REPRESENTATIVE

During the performance of the Contract, the Contractor shall have on site during working hours a designated Project Manager empowered to act on behalf of the Contractor in all matters pertaining to the Contract. The Contractor shall within seven (7) days of execution of the Contract, nominate such person or persons, in writing, to the Engineer. Such person or persons shall remain, in the context of this Contract, the Contractor's designated agent(s) until such time as notification to the contrary is received in writing by the Engineer.

Ps. 1.03 CONSTRUCTION UTILITIES AND MISCELLANEOUS FACILITIES

1. Power

Unless otherwise specified, the Contractor shall provide at his own expense all necessary power and special connections to power lines.

2. Water

Unless otherwise specified, the Contractor shall provide at his own expense all necessary water and special connections to a potable water supply.

3. Telephone

The Contractor shall provide at his own expense, a telephone service and required secretarial extension, at each of the Contractor's and Engineer's office. A radio telephone service is not acceptable as a substitute for the required telephone service. Long distance phone calls made by the Engineer shall be paid for by the Owner upon receipt of the proper documentation.

4. Sanitary Facilities

The Owner shall supply the Personnel Hygiene Facility which will be equipped with toilet facilities. The Contractor shall provide at his own expense any additional toilet facilities for all workmen and the Owner's representatives employed on the work. The Contractor shall maintain at his own expense all facilities in a sanitary condition from the beginning of the work until completion

and shall then remove the facilities and disinfect the premises. All portions of the work shall be maintained at all times in a sanitary condition.

5. Parking Facilities

A vacant lot at the south east corner of Bankson Street and North Street will be made available by Velsicol to the Contractor for parking. All costs associated with levelling, maintaining, and final cleanup of this area shall be the responsibility of the Contractor.

Should additional off-road parking be required the Contractor shall supply additional areas at his own expense.

6. Temporary Heating

The Contractor shall provide at his own expense temporary heating, covering and enclosures as necessary to protect all work and material against damage by dampness and cold and to facilitate completion of the work. The Contractor shall supply all the fuel, equipment and materials required for temporary heating.

7. Personnel Hygiene Facility

The Owner shall provide a personnel hygiene facility as outlined in Section Ps. 8 equipped with lockers, shower facilities, sanitary facilities and a laundry area. The Contractor shall be responsible for siting and leveling the trailer and providing the necessary connections to sanitary water and electrical services.

Ps. 1. 04 SURVEYS

Unless otherwise specified, the Engineer will establish reference bench marks and base lines adjacent to the work. The Contractor shall develop and make such additional detail surveys as are needed for construction, such as slope stakes, batterboards, stakes for pile locations and other working points, lines and elevations. Bench marks, base lines, property boundaries, line and grade hubs, and other references and construction points, and such survey points shall thereafter be maintained. The Contractor shall notify the Engineer in writing at least five (5) working days in advance of the time he will commence work on any part of the construction.

The Engineer shall be responsible for measurement of all items for payment. The Engineer shall provide a certificate of such measurements to the Contractor.

The Contractor shall provide reasonable and necessary opportunities and facilities for setting points and making measurements during construction. He shall not proceed until he has made request to the Engineer for, and has received from him, such points as may be necessary as the work progresses. The construction shall be done in conformance with such points.

Ps. 1. 05 LANDS BY OWNER

The Owner will provide certain lands, in connection with the work under the Contract, together with the right of access to such lands. The Contractor shall not unreasonably encumber the premises with his plant or materials.

Ps. 1. 06 LANDS BY CONTRACTOR

The Contractor shall provide, with no liability to the Owner, any additional land and access thereto not shown or described that may be required for temporary construction facilities or storage of materials. He shall construct all access roads, detour roads, or other temporary work as required by his operations. All such areas must be approved by the Engineer prior to use by the Contractor.

Ps. 1. 07 EXISTING UTILITIES

In general the locations of some existing major utilities, whether aboveground or underground, are indicated on the drawings. This information has been obtained from utility maps and from verbal descriptions provided by the various agencies involved. The Engineer or the Owner do not guarantee the accuracy or completeness of this information and it is to be understood that other aboveground or underground facilities not shown on the drawings may be encountered during the course of the work. In any case, minor lines such as water, gas, and sewer services are not indicated.

Existing aboveground utilities, including but not limited to power transmission and distribution, telegraph, telephone and traffic control systems, whether shown on the drawings or not, shall, at the Contractor's expense, be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor in a manner satisfactory to owners and operators of the utilities and to the Owner.

Existing major underground utilities and appurtenant structures whether shown on the drawings or not, shall, at the Contractor's expense, be maintained, relocated, rerouted, removed and restored by the Contractor.

Minor underground utility service lines, including but not limited to sanitary sewer services, gas services, water services, house or yard drains, and electric or telephone services, shall be maintained, relocated, rerouted, removed and restored by the Contractor with the least possible interference with such services and in no case shall the interference of such service lines be considered for extra compensation under any of the special cases listed above.

The right is reserved by owners of public utilities and franchises to enter upon any street, road, right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or changes caused by the work. The costs thus incurred shall be paid by the Contractor.

Ps. 1. 08 RESTORATION OF STRUCTURES AND SURFACES

1. Structures

The Contractor shall remove such existing structures as may be necessary for the performance of the work, and if such structures are not shown or specified for demolition, shall rebuild the structures thus removed in as good a condition as found with minimum requirements as herein specified. He shall also repair all existing structures which may be damaged as a result of the work under this Contract.

2. Curbs, Gutters, Driveways and Sidewalks

All curbs, gutters, driveways, sidewalks and similar structures that are broken or damaged by the installation of the work, unless shown otherwise, shall be reconstructed by the Contractor. Reconstruction shall be of the same kind of material with the same finish, and in not less than the same dimensions as the original work. All concrete shall be as specified herein unless otherwise indicated. Repairs shall be made by removing and replacing the entire portions between joints or scores and not merely refinishing any damaged part. All work shall match the appearance of the existing improvements as nearly as possible.

3. Roads and Streets

All roads and streets in which the surface is removed, broken or damaged, or in which the ground has caved or settled due to work under this contract, unless shown otherwise, shall be completely resurfaced and brought to the original grade and crown sections unless otherwise indicated. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean, solid, vertical faces, and shall be free of any loose material. Paving shall be as indicated and specified. Roadways used by the Contractor for hauling materials, equipment, supplies, etc., shall be cleaned and repaired if the condition of the roadway is damaged or otherwise affected due to the Contractor's operations. Special conditions regarding prevention of spilling and cleanup are specified elsewhere. These requirements are the Contractor's responsibility.

4. Cultivated Areas and Other Surface Improvements

All cultivated areas, either agricultural or lawns, and other surface improvements which are damaged by actions of the Contractor, unless otherwise shown, shall be restored as nearly as possible to their original condition. Altering of original conditions during restoration must be done only on written approval of the Engineer.

5. Existing Stakes and Marks

All section, section subdivision, plat, U. S. E. D, U. S. C. & G. S. , U. S. G. S. and other official monuments or bench marks shall be carefully preserved or replaced. In the event any such monument or marker is disturbed as a result of the Contractor's operations, the Contractor shall replace or reset such monument or marker in a manner satisfactory to the Engineer. Replaced or reset monuments shall be of acceptable type and quality and shall be located so as to clear existing utilities or any other interferences. They shall be placed in a manner consistent with good and recognized engineering and surveying practice by a Michigan State licenced surveyor.

Ps. 1. 09 FIELD TESTS AND ADJUSTMENTS

All work shall be tested by the Contractor to the satisfaction of the Engineer before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the work has been properly performed. Any changes, adjustments or replacements required to bring the work into conformance with the Specifications shall be carried out by the Contractor as part of the work.

Ps. 1. 10 CLEANING UP

The Contractor shall not allow the site of the work to become littered with trash and waste material, but shall maintain the same in a neat and orderly condition throughout the construction period. On or before the completion of the work, the Contractor shall carefully clean out all pits, chambers or conduits and shall tear down and remove all temporary structures provided by him and shall remove rubbish of all kinds from any of the grounds which he has occupied and leave them in first-class condition to the satisfaction of the Engineer.

The Contractor is advised that the final cleanup of the project shall be done with meticulous care.

Ps. 2 CONSTRUCTION

Ps. 2.01 GENERAL

The Contractor shall perform his work in such a manner as not to harm the undisturbed condition of the underlying or adjacent soils or damage or prevent the proper placement of fill. The Contractor shall bear the cost of any repair required by the Engineer as a result of unnecessary disturbance of soils adjacent to the construction area.

a) Removal of Obstructions

Unless otherwise noted, the Contractor shall remove all brush, trees, logs, stumps, roots, heavy sods, heavy growth of grass, all decayed vegetable matter, fences and all structures where the proper construction and completion of the work require their removal. Disposal of this material shall be at the Contractor's expense.

Material that is removed as herein specified shall be disposed of on the Plant Site as directed by the Engineer.

b) Excess Excavated Material

Material excavated from the internal groundwater collection system trenches, downgradient containment wall construction, gas vent installation, and all other excess excavated material shall be spoiled on-site in a location as directed by the Engineer. No salvage of materials will be allowed. All spoiled material shall be covered with a compacted layer of clayey fill not less than 12 inches in depth compacted to 90% Standard Proctor Density.

c) Shoring, Sheeting and Bracing

Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained, and except as shown or specified otherwise, removed by the Contractor.

All sheet piling, shoring, sheeting and bracing shall be designed by a Professional Engineer engaged by the Contractor with demonstrated competence and experience in such work. The sheeting system shall be designed to prevent bottom failure and hydrostatic uplift within the excavation. Provision shall also be made in the design for lateral pressures due to side slope and construction equipment or other surcharge loads, as applicable.

The Contractor shall provide to the Engineer for his review, design calculation and arrangement drawings of the sheeting system prior to ordering any materials for bracing, sheeting, etc., and prior to the commencement of the excavation.

All material, except as otherwise specified, used for sheeting and sheet piling, lagging, braces, shores and stringers, or waling strips shall be of approved quality and dimensions throughout.

Materials for sheeting systems shall be furnished and driven or set in place by the Contractor, where necessary or wherever ordered by the Engineer, whether the same is or is not considered necessary by the Contractor. If, in the opinion of the Engineer, the material furnished by the Contractor is not of proper quality or sufficient size or not properly placed to ensure the safety of the work or of adjacent structures and property, the Contractor shall, upon notice from the Engineer to that effect, forthwith procure, furnish and set in place or drive other and satisfactory material, or place the material in a satisfactory manner; and if he shall fail or neglect to do so, the Engineers may order all or any part of the work to be stopped until such material so used is furnished and placed; and the Contractor shall not be entitled to claim, demand or receive any compensation for larger size or better quality or different disposal of material ordered by the Engineer, nor any compensation for allowance of any kind whatsoever for or on account of any damage or delay resulting from such stoppage of work.

Steel sheet piling may be either new or used. It shall be of adequate strength, straight and properly braced. Steel sheet piling shall be of the interlocking type. Friction in the interlocks shall not be assumed to contribute to the strength of the sheet piling.

The design, planning, installation and removal, if required, of all sheet piling, shoring, sheeting and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.

Steel sheet piling for the excavation shall be driven straight and in line. The piling shall be supported above ground, before driving, by a guide frame at least 20 feet high which will keep the piling accurately in the required position and vertical. Each piece of piling shall be driven only a few feet at a time and driving shall proceed continuously around the perimeter so that the piles shall reach their full penetration together.

Walers and bracing shall be supplied and installed as required to complete the sheeting system. Walers and braces shall be of adequate strength for the loads imposed. Splices in walers shall develop the full strength of the member in bending, shear and axial compression.

If bracing members are to be removed during construction, the timing and procedure for removal shall not induce excessive stresses in the permanent structures or in steel sheet piling and bracing members.

If the construction sequence of structures requires the transfer of bracing to the completed portions of any structure, the

Contractor shall secure written acceptance of the Engineer prior to the installation of such bracing.

In trenching operations the use of horizontal strutting below the barrel of pipe or the use of the pipe as support for trench bracing will not be permitted. The use of a traveling shield for sewer construction shall require that the device be approved for use by a Professional Engineer. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loadings which might overload the pipe.

The neglect, failure or refusal of the Engineer to order the use of sheeting, or sheet piling, or steel or to order the same to be left in place, or the giving or failure to give of any order or directions as to the manner or methods of driving or placing sheeting, sheet piling, bracing, shores, etc., shall not in any way relieve the Contractor of any or all obligations under this Contract. Sheeting left in place shall be cut off 1' below existing grade.

The rules of the OSHA and the State Department of Labor with respect to excavation and construction shall at all times be strictly observed.

d) Control of Water

All excavation and placement of services, backfill and fill shall be carried out in the dry. The Contractor shall furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during construction, and shall dewater and dispose of such water. He shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage, and shall have available at all times competent workmen for the operation of the pumping equipment. The dewatering systems shall not be shut down during work stoppage without written permission from the Engineer. Disposal plans for removed groundwater shall be approved by the Engineer prior to disposal.

The control of groundwater shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" during excavation shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils.

During excavation, construction of structures, installing of subdrains, placing of structures and trench backfill and the placing and curing of concrete, excavations shall be kept free of water. The Contractor shall control surface runoff so as

to prevent entry or collection of water in excavations.

Before dewatering is started, the Contractor shall obtain acceptance by the Engineer for the method, installation and details of the dewatering system he proposes to use.

The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines or subdrains.

During all phases of construction dewatered groundwater from the Plant Site shall be considered contaminated. All groundwater collected shall be disposed by the Contractor in the on-site leachate holding tank. The Owner shall be responsible for final disposal of the collected waters from the on-site holding tank at the deep well.

Ps.3 DOWNGRADIENT CONTAINMENT WALL

Ps.3.01 GENERAL

The work shall consist of constructing an impervious continuous soil/bentonite slurry containment wall along the downgradient side of the Plant Site as shown on the Contract Drawings. Excavation of the containment wall shall be in accordance with these specifications and shall be carried out from a level working platform twelve (12) feet in width centered about the center line of the containment wall.

Included in the containment wall construction is the construction of a clay control berm along the river side of the containment wall and furnishing all labor, plant, equipment and materials required to effectively complete the work outlined in the specifications.

Ps.3.02 MATERIAL

All material used on this Contract must be approved by the Engineer prior to use.

a) Bentonite

The bentonite used for this Contract shall be slurry Gel #125 by International Minerals and Chemical Corporation or an approved equal, naturally powdered, pure, premium grade Wyoming type, sodium cation-base bentonite consisting mainly of the clay mineral sodium montmorillonite and displaying high swelling characteristics. All bentonite used shall meet the standards outlined in the current API specifications 13A "Oil Well Drilling Fluid Material". Each shipment of bentonite when received on-site, shall be furnished with written Certification of Compliance in quadruplicate and a copy of the test reports from the bentonite manufacturer verifying that the bentonite is a premium grade natural bentonite meeting the requirement of API specifications 13A. Copies of the certification and the test reports shall be submitted to the Engineer for his review and a subsequent submittal to the EPA/MDNR upon receiving each shipment of bentonite. No bentonite shall be used until the Contractor has received approval from the Engineer that the bentonite is of premium quality. Bentonite not meeting specifications shall be promptly removed from the site of work and replaced with bentonite conforming to specifications.

The use of chemically pretreated bentonite will not be allowed on any portion of this Contract.

b) Water

The Contractor shall be responsible for securing a suitable source of water for bentonite slurry mixing. The water shall be fresh and clean and must meet the standards specified below:

- i) A pH >7.0
- ii) Calcium < 500 ppm
- iii) Oil, organics, acids, alkali, soluble salts, or other deleterious substances < 50 ppm each

The Contractor shall submit test results to the Engineer prior to commencing any slurry mixing, verifying that the water quality meets the stated specifications.

c) Slurry Control Agents

The use of thinners, dispersants and flocculants may be used by the Contractor to attain and control standard properties of the slurry, particularly the apparent viscosity, gel strength, and filtration characteristics provided the final properties of the soil bentonite wall are not altered. The Contractor shall inform and receive approval from the Engineer of any additives to be used.

Peptizing or bulking agents will not be permitted for mixing with slurry.

d) Imported Clay

Clay used for construction of the working platform and the control berm adjacent to the containment wall shall be clean clay soil obtained from the approved project borrow pit located as shown on the Contract Drawings. Clay shall be removed from the borrow pit only at locations as directed by the Engineer.

e) Backfill

Backfill material for the downgradient containment wall shall be imported material, thoroughly mixed with bentonite slurry. Backfill shall be kept free from roots, organic matter, peat, diatomaceous earth or other deleterious materials. The source of backfill material shall be the approved project borrow pit.

Imported backfill material shall be suitable material containing greater than 25% plastic fines (25% of the soil particles passing a U.S. Standard No. 200 sieve). Backfill material larger than three (3) inches will not be accepted. All excavated material shall be disposed of on the Plant Site in an area designated by the Engineer and covered with clean clayey fill.

Ps.3.03 MIXING OF SLURRY

a) Equipment

The Contractor shall provide a continuous venturi mixer capable of producing a colloidal suspension of bentonite in water for preparation of all slurry. The slurry mixing plant shall include a mechanically agitated sump, pumps, valves, hoses, supply lines,

small tools and all other plant and material required to adequately supply slurry to the trench.

The Contractor shall construct adequate containment areas for the storage and hydration of mixed slurry. After mixing, slurry shall be pumped to the holding ponds for final hydration of bentonite. The ponds shall be sized to provide an adequate supply of slurry for 3 to 4 days of construction in case of equipment failure or in case of a substantial loss of slurry in the trench should a highly pervious strata be encountered. The ponds shall be located in an area approved by the Engineer. The Contractor shall restrict his plant activities within this designated area unless given approval by the Engineer to expand or move his plant to other areas of the Plant Site.

Slurry within the hydration ponds shall have Marsh funnel tests performed on it as a minimum three (3) times daily. Additional tests shall be performed on the slurry after a rainfall to maintain proper physical properties.

The construction of the holding ponds shall be such that no material is excavated on the Plant Site. All material used for the holding ponds must be clean imported material from the approved borrow pit.

At the completion of the containment wall construction the Contractor shall dispose of excess slurry in an area approved by the Engineer and cover the spoiled slurry with clean imported clay. The holding ponds shall be regraded and covered with clean imported clay fill.

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b) Mixing

The bentonite slurry for supporting the sides of the trench and for mixing with the backfill material shall consist of a suitable suspension of a quality natural bentonite and clean water thoroughly mixed and agitated to avoid formation of lumps. Mixing shall be continued until the bentonite particles are fully hydrated and the slurry appears to be at the proper consistency. At no time shall the slurry be mixed in the trench.

Mixing operations shall not be carried out when ambient temperatures are below 35 degrees F. Should the Contractor anticipate temperatures below 35 degrees F, he must take precautionary measures to protect slurry in the containment areas and in the trench from freezing using suitable approved cover.

After mixing, the slurry shall be pumped into the slurry containment areas to allow the bentonite to expand fully. The Contractor shall provide a means of agitating and recirculating the slurry in the containment areas in order to maintain a homogeneous slurry mixture. The slurry shall be pumped from the containment area to the excavated trench when required.

The Contractor shall ensure that the slurry level in the trench is kept at a minimum three (3) feet above the groundwater level. Should a sudden drop in the slurry level occur, or a sudden rise in the groundwater level occur, the Contractor must immediately make the appropriate adjustments to the slurry level in the trench.

The Contractor shall keep personnel on call weekends and holidays to ensure that the slurry level in the trench remains at least three (3) feet above the groundwater level.

c) Slurry Properties

Flow properties and control limits of the slurry as specified herein shall be determined according to procedures outlined in the API Recommended Practice 13B "Standard Procedures for Testing Drilling Fluids" or unless otherwise specified herein.

When pumped from the slurry containment areas to the trench, the slurry must have the following properties:

- i) Apparent viscosity of 40 seconds Marsh
- ii) Density \geq 67 pcf
- iii) pH \geq 7.0

Continual testing of the slurry in the trench at a minimum four times daily, shall be carried out throughout the slurry construction in order that the following slurry properties are maintained within the trench:

- i) An apparent viscosity of 40 seconds Marsh
- ii) Slurry density less than 15 pcf that of backfill material
- iii) $7.0 \leq$ pH < 12.0

Should the slurry fall below the stated limits at any time during construction of the downgradient containment wall, the Contractor shall immediately recirculate, remove or adjust the slurry such that it complies with the above specifications.

Ps.3.04 WORKING PLATFORM

Construction of the downgradient containment wall shall at all times be carried out from a level clay working platform. The working platform shall be a minimum of twelve feet wide centered along the center line of the containment wall.

The working platform shall be constructed as close to the river as good construction practices allow, to the lines and grades as shown on the Contract Drawings. Clay from the approved borrow pit shall be transported, placed and compacted in six inch lifts to 98% maximum Modified Proctor Density. Clay shall be removed from the borrow pit only at locations as directed by the Engineer. The working platform shall be a minimum of two feet deep such that it will key into the final clay cap.

Any material excavated from the Plant Site during construction of the working platform shall be disposed of on the Plant Site in an area designated by the Engineer and covered with clean clayey fill.

Ps.3.05 CLAY CONTROL BERM

A clay control berm shall be constructed along the Pine River side of the downgradient wall working platform. Extreme care shall be taken to preserve and maintain the berm throughout the duration of the Contract to prevent migration of slurry into the Pine River.

The berm shall be constructed using clay from the approved clay pit to the line and grades approved by the Engineer and shall be compacted in 12 inch lifts to 90% Standard Proctor Density. The top of the berm shall be kept a minimum of two (2) feet above the top of the downgradient working platform.

Ps.3.06 ON-SITE HAUL ROADS

On-site haul roads are presently located on the Plant Site as shown on the Contract Drawings. Maintenance of these haul roads and construction of any new haul roads shall be the responsibility of the Contractor. The cost of such haul road construction or maintenance shall be included in the Bid Price for Phase II construction.

On-site haul roads shall be maintained in a condition satisfactory to the Engineer.

Ps.4 SLURRY TRENCH EXCAVATION

Ps.4.01 GENERAL

The excavation of the containment wall shall be in accordance with these specifications and along the line and grades shown on the Contract Drawings. Throughout the entire Contract, excavation of the trench shall be from a level clay working platform, constructed a minimum of twelve (12) feet in width and centered along the center line of the containment wall.

Ps.4.02 EQUIPMENT

The Contractor shall carry out the trench excavation using any suitable earthmoving equipment such as backhoes, draglines, clamshells, or any combination thereof provided the equipment can perform the required work as specified. The equipment shall be capable of excavating the 24 inch wide trench in one pass to the depths specified on the Contract Drawings.

Equipment used for mixing the backfill shall be a suitable type of earthmoving or grading equipment such as a bulldozer, blade grader or blender that is capable of thoroughly mixing the backfill material into a homogeneous consistency.

Ps.4.03 ALIGNMENT AND DIMENSIONS

Excavation of the downgradient containment wall trench shall be to the lines and grades shown on the Contract Drawings. The trench shall be 24 inches wide and shall be to a depth such that the wall is keyed into the underlying clay till layer 36 inches. Any excess excavation of the trench for the convenience of the Contractor or for any other purpose shall be at the Contractor's expense unless otherwise directed in writing by the Engineer. All areas of overexcavation shall be backfilled with material approved by the Engineer at the Contractors expense.

The Contractor shall be responsible for continually monitoring the trench excavation to ensure the plumbness of the trench walls.

At points of direction change having a radius less than 30 feet, or at 90° corners, the Contractor shall ensure continuity of the wall by excavating beyond the centreline of the intersecting wall a minimum of ten (10) feet. This additional excavation shall be included in the bid price for the wall construction. Extreme care shall be taken by the Contractor to excavate all material at these direction changes ensuring that no windows of unexcavated material remain within the backfilled containment wall.

Throughout the course of the trench excavation, the Contractor shall profile the trench by passing the digging tool horizontally and vertically over the full depth and length of the excavated trench prior to placing backfill in the trench. Sediment that collects in the bottom of the trench shall be removed with excavating equipment or with an air lift pump.

During the entire containment wall installation, representatives from Velsicol and from the EPA/MDNR shall be present to witness the native material excavated from the trench every 25 feet of trench installed in order to certify that the containment wall has been founded in clay. At this same 25 foot interval, the Engineer shall take depth soundings to verify that the base of the wall is at design grades. The Contractor shall at all times accommodate the aforementioned representatives.

Borelogs taken along the line of the downgradient containment wall indicating the depth to clay till and the nature of soils to be excavated are provided within Appendix B.

Ps.4.04 TESTING

Throughout the construction of the downgradient containment wall, the Contractor shall be responsible for performing quality control testing to monitor the quality of all construction material and to ensure the maintenance of slurry and backfill mixing properties. Results of all quality control testing shall be included within the daily report filled out by the Contractor and made available to the Engineer each day. As a minimum, the Contractor shall be responsible for performing the following quality control tests:

- i) Slump Cone Test
 - one test performed for every twenty-five (25) cubic yards of backfill mix
- ii) Gradation Test
 - four tests performed on backfill mix per eight (8) hour shift
- iii) Methylene Blue Test
 - four tests performed on backfill mix per eight (8) hour shift
- iv) Unit Weight
 - performed on slurry samples pumped from bottom of trench and on backfill mix being added to trench at least once each hour of working shift
- v) Marsh Funnel
 - performed on slurry samples pumped from the trench at least four times daily
 - performed on slurry samples in holding ponds at least four times daily
 - increase to one test each hour during, and for one day after a rainfall

In addition, the Engineer will collect representative samples for testing during the downgradient wall construction as verification of material properties. The Engineer shall perform the following tests:

- i) Triaxial Permeability Test
 - performed on cores taken from each 500 lineal feet of installed wall
- ii) Slump Cone Test
 - one test performed for every one hundred (100) cubic yards of backfill mix
- iii) Gradation Test
 - one test performed on backfill mix per eight (8) hour shift
- iv) Methylene Blue Test
 - one test performed on backfill mix per eight (8) hour shift
- v) Unit Weight
 - performed on slurry samples pumped from bottom of trench and on backfill mix being added to trench at least two times per working shift
- vi) Marsh funnel test
 - one test performed on slurry in trench per eight (8) hour shift
 - one test performed on slurry in ponds per eight (8) hour shift
 - two tests performed on slurry in ponds per eight (8) hour shift during, and for one day after a rainfall

The Contractor shall provide assistance as required by the Engineer in the collection and testing of samples.

Ps.4.05 EMERGENCY PROCEDURES ALONG EXCAVATION

In the highly unlikely event that barrels, canisters, or chemical gases or vapors are uncovered during the downgradient containment wall construction the following procedures shall be followed:

i) Vessels

In the event that barrels or canisters are encountered during excavation all work shall immediately cease and all workmen be removed from the work area. Velsicol officials shall be immediately notified and they shall identify vessel contents, handling procedures and storage and disposal techniques prior to re-commencing work.

ii) Excessive Chemical Gases or Vapors Generated from Excavated Face

In the event of excessive gases or vapors along the trench excavation, the following actions will be taken:

- a) Remove all workers from the area.
- b) Monitor contaminant concentrations to determine the type of respiratory protective device that will be required before workers re-enter the area.

iii) Major Leak of a Toxic Gas

In the highly unlikely event of a major leak of Toxic gas, such as might occur if a compressed gas cylinder were encountered and ruptured during excavation, all on-site personnel will be evacuated to a safe distance and the "Emergency Contingency and Response Plan", as proposed in Section Ps.10, shall be implemented.

Ps.5 TRENCH BACKFILLING

Ps.5.01 GENERAL

The Contractor shall not begin backfilling the containment wall until the Engineer has satisfied himself that both the backfill mix and the trench has been sufficiently tested meeting all required specifications.

Ps.5.02 MATERIAL

All material excavated for the downgradient containment wall shall be spoiled on-site and clean imported fill used for the backfill mix. Imported backfill shall be thoroughly mixed with the bentonite slurry prior to backfilling the trench.

Imported backfill material, shall be suitable material obtained from the project borrow pit containing greater than 25% plastic fines. Backfill material larger than three (3) inches will not be accepted.

Ps.5.03 MIXING AND PLACEMENT

Mixing of the backfill shall take place adjacent to the slurry trench excavation using equipment that will guarantee thorough mixing of the excavated material and the bentonite slurry. Mixing equipment shall not run any closer than 15 feet from the edge of the trench. The slurry used for backfill mixing shall be taken from the trench, not the hydration pond.

Backfill material shall not have a bentonite content greater than 3% by dry unit weight and when placed in the trench shall have a slump of two (2) inches to six (6) inches. Slump shall be determined using the method outlined in the slump cone testing Specification ASTM C 143-66. Sluicing of backfill mix with water to produce the desired slump will not be permitted.

Backfilling of the excavated trench shall not commence until the Engineer has satisfied himself that the trench and backfill material meet the specifications and not until the excavation of the trench is at least 100 feet ahead of the backfilling. When the backfilling operation commences, the toe of the backfill slope in the trench shall be no more than 250 feet and no less than 100 feet away from the toe of the trench excavation.

Backfill material shall be placed in the trench, no sooner than 24 hours after excavation begins, at its natural angle of repose, at a point where the backfill rises to the top of the working platform. As the trench is backfilled the slurry should be displaced along the trench. No free dropping of backfill material into the trench shall be permitted.

The Contractor shall be responsible for maintaining and protecting the containment wall in place from damage caused by differential hydraulic pressures, equipment travel and all other possible damaging influences.

Ps.5.04 CONTAINMENT WALL CAP

Upon completion of the soil-bentonite containment wall and all subsequent quality control testing, the Contractor shall construct a clay cap over the wall to prevent groundwater from filling the trench and to prevent drying and cracking of the soil/bentonite wall. Clay for the cap shall be obtained from the approved sources and shall be placed in 6 inch lifts compacted to a minimum density of 90% Standard Proctor Density. Capping shall not commence for at least 1 week after backfilling the trench.

Ps.6 INTERNAL GROUNDWATER COLLECTION SYSTEM

Ps.6.01 EXTENT OF WORK

- a) The work shall consist of site clearance, trench excavation, bedding and backfill, dewatering, restoration and all other work necessary for the complete construction of the internal groundwater collection system and appurtenances.

Ps.6.02 MATERIALS

1. General

- a) All materials, with the exception of clay fill, required for the performance of this Contract shall be supplied by the Contractor.
- b) All materials supplied by the Contractor shall be delivered to and stored on the site in a manner satisfactory to the Engineer. All fabricated materials shall be inspected by the Contractor for damage in transit.
- c) No defective material shall be delivered to the site and materials found defective at any time shall be removed immediately and replaced at the Contractor's expense.

2. Perforated Clay Pipe

- a) Perforated Clay pipe for the collection system construction shall be Logan perforated clay pipe or approved equal with self centering joints, and shall comply with ASTM Specifications C-700. Perforated pipe shall be extra strength pipe with 1/4"Ø perforations. Configuration of the perforations shall be as shown on the Contract Drawings.

3. Precast Manholes and Manhole Sumps

- a) All manholes shall have a reinforced 3000 p.s.i. concrete base constructed as shown on the Contract Drawings or a precast base may be used if the base is placed on 6" of compacted granular "6A" (100% Standard Proctor) extending 12" beyond the outside diameter of the base.
- b) All manhole risers, tops and bases shall be precast reinforced concrete in accordance with ASTM Specification C-478, or latest revision.

4. Cast Iron Frames, Covers and Side Inlet Castings

Frames and covers for manholes and manhole sumps shall be Neenah Foundry Co. R-1916-G Type L waterproof manhole frame with anchor bolts and bolt holes, or approved equivalent as shown on the Contract Drawings.

5. Manhole Bricking

Manholes and manhole sump frames and lids shall be brought to final grade using approved bricking. Bricking shall be placed no more than 5 rows high and no less than 3 rows high.

6. Bedding Material

All collection system bedding shall be approved Michigan Department of Transportation coarse aggregate '6A' bedding, as specified on the Contract Drawings. The bedding shall be compacted to 95% Standard Proctor Density.

7. Backfill Material

All collection system backfill shall be Class 'I' granular material as specified on the Contract Drawings. Backfill shall be compacted to 95% Standard Proctor Density. At no time shall native material be used for trench backfill.

8. Manhole Steps

All manhole steps shall be manufactured of hot dipped galvanized iron as shown on the Contract Drawings.

Ps.6.03 LINE AND GRADE

- a) The Contractor shall supply, erect and maintain approved batter boards and sight rails to ensure accurate line and grade of all piping. At least 3 batter boards shall be in use at all times, placed not more than 50 feet apart. The Contractor may use other methods of setting line and grade such as laser providing the method is approved by the Engineer prior to use.
- b) No deviation from the line and grade set out by the Engineer will be tolerated, except where changes in direction or the laying of pipes along a curve are limited to the pipe manufacturer's tolerances for joints.
- c) To test for Line and Grade during pipe laying between adjoining manholes or structures, elevation and alignment surveys will be made by the Engineer at a minimum of 25 feet intervals along the installed piping and at each manhole or sump. This test will be applied to each completed working section of collection system before its acceptance. The Contractor shall take up and relay all pipe which is not in true alignment or shows any settlement after laying.

Ps.6.04 TRENCH EXCAVATION

- a) Trenches shall be excavated to the alignment and depth required.
- b) Trench Width
 - i) The transition trench width shall be applicable in all cases except when otherwise specified on the Contract Drawings.
 - ii) The following conditions shall apply when width is specified.
 - a) Minimum - The width of trenches shall be such as to give a maximum clearance of 12 inches on each side of the barrel of the pipe, plus the actual additional width required for sheeting and shoring.
 - b) Maximum - The width of the trench at the top of the pipe shall be not greater than 3 feet, plus the outside diameter of the pipe.
- c) The width of the trench at ground level will not be less than the width at any depth in the trench. Fill overbreak and slides which have occurred during excavation will be excavated and backfilled with approved materials.
- d) Where trench excavations are not kept within the design limits of the pipe, the Engineer may order sheeting and shoring, and/or a heavier class of pipe, and/or use of a higher class of bedding. No extra payment will be made for such remedial action.
- e) The pipe trench shall be graded and shaped and the specified bedding shall be provided, to give uniform and even bearing for the length of the pipe, and bell holes shall be dug at each joint. All correction in the grade shall be made with compacted granular material acceptable to the Engineer, or with fill concrete, all at the Contractor's expense.
- f) Ledge rock, boulders, masonry and other debris shall be removed to provide a clearance of at least 6 inches below and on all sides of the pipe or structure.
- g) Where the subgrade is inadequate to support the pipe, the Engineer will instruct the Contractor as to the proper procedure, and such additional work so ordered will be paid for as described in the Form of Bid.

Ps.6.05 LAYING AND JOINTING OF PIPE

- a) All pipes shall be laid and jointed in strict accordance with ASTM C-12 "Standard Practice for Installing Vitrified Clay Pipe Line" and the manufacturer's recommendations and instructions, and with the approval of the Engineer.

- b) The laying of the pipe shall start at the lowest pipe and shall be laid upgrade, unless otherwise instructed by the Engineer. The pipes shall be firmly fixed and accurately set to line and grade during construction of the specified bedding, with the inverts smooth and uniform.

Ps.6.06 BEDDING

The trench shall be backfilled and compacted for a specified height above the top of the pipe, in accordance with the details described in Section Ps 6.02.6, and Ps 6.12.

Ps.6.07 PIPING TO BE KEPT CLEAN

During the progress of the work and until the completion and final acceptance, the piping and connections shall be kept free of sediment or debris. If, in the final inspection of the piping, any obstruction or deposit is discovered, it shall be removed by the Contractor.

Ps.6.08 LENGTH OF OPEN TRENCH

The Contractor shall not continue excavation and pipe laying at any time when two or more manholes, including benching, are incomplete.

Ps.6.09 PROTECTION OF PIPES FROM DAMAGE

The Contractor shall assume full responsibility for the protection of pipes from crushing after backfilling. Where pipes are laid with shallow cover, the Contractor shall barricade the trench to protect the pipe from damage by trucks or other heavy equipment.

Ps.6.10 MANHOLE BENCHING

- a) Manholes shall be benched with 3,000 p.s.i. concrete. Channelling shall have a semi-circular bottom and vertical sides extending up to 0.8 of the pipes diameter entering or leaving the manhole. Ledges at the side of channels shall have a slope of an inch per foot unless shown otherwise on the Contract Drawings.
- b) Where there is a difference in elevation between the incoming and the outgoing pipe, the channelling shall slope downward from the higher pipe at a slope not steeper than 1 to 1, except where shown otherwise on the drawings or as directed by the Engineer.
- c) The Contractor is strongly recommended to procure factory benched manholes for this project.

Ps.6.11 ELEVATION OF MANHOLES AND MANHOLE SUMPS DURING CONSTRUCTION

- a) Manholes and manhole sumps shall be constructed such that not less than 3 nor more than 5 courses of manhole brick or approved equivalent will be required to adjust the cast iron frames to final top of clay cap elevation. Final elevation of the top of the frames and cover shall be 6" above the finished clay cap.
- b) Cast iron frames shall initially be set on the concrete at the time of construction and temporarily grouted in place. Final bricking will be performed by others.

Ps.6.12 BACKFILLING

- a) The Contractor shall complete the specified type of bedding and shall obtain the Engineer's approval of the specified bedding, before any backfilling.
- b) Backfilling of all trenches shall be carried out continuously and immediately after the specified bedding has been completed and approved by the Engineer.
- c) The trench shall be backfilled in layers not exceeding 12 inches and shall be compacted to a density of at least 95% Standard Proctor Density.
- d) Soil density tests may be ordered by the Engineer, at the expense of the Owner, to confirm that the specifications described herein for granular bedding and trench backfilling have been followed. Re-excavation, backfilling and additional compaction expense if required to meet the specifications shall be borne by the Contractor.

Ps.6.13 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- a) Material excavated from the trench shall be hauled, placed and spread on the Plant Site as directed by the Engineer. Disposed trench spoils shall be covered with 12" of clean imported clayey fill placed in 6" lifts compacted to 90% Standard Proctor Density.
- b) Due to the nature of the fill material presently on the Plant Site concrete and/or steel including piping may be encountered during trench excavation. In most cases, the alignment of the pipe has been adjusted to avoid these areas. This material, if encountered shall be broken up or cut up into manageable sizes and disposed of on the Plant Site in an area designated by the Engineer. Any subsurface piping shall be cut off 5 feet on either side of the trench and disposed on the Plant Site. The cut ends of the pipe shall be plugged with a concrete plug. No salvage of materials will be allowed.

- c) The Contractor shall note that some of the subsurface piping may be filled with unknown material. During pipe removal Contractor personnel shall use self-contained air respirators when in the pipe trench or adjacent to the work area. The Contractor shall submit his proposed plan for severing piping in a safe manner, to the Engineer for approval, prior to commencing subdrain installation.

Ps.6.14 GRANULAR INTERCEPTOR SUMPS

A fifteen (15) foot square granular sump shall be constructed at the upgradient ends of all interceptor drains as detailed on the Contract Drawings. The capped ends of the interceptors shall be extended half way into the sumps. Granular material for the sumps shall be Class "I" granular material compacted to 95% Standard Proctor Density.

Ps.6.15 DEWATERING

The Contractor shall be responsible for maintaining the trench excavation in a dry condition during the subdrain installation as specified in Section Ps.2.01(d). All groundwater collected from the collection system trench excavation shall be disposed of in the on-site holding tank.

Ps.7 FINAL COVER

Ps.7.01 GENERAL

The work included within this section includes all labor and materials required to place the final cover over the Plant Site including all post construction monitoring facilities and river bank armoring and stabilization. The northern section of the Plant Site has been capped under Phase I construction.

Prior to commencing the capping of the Plant Site the Contractor shall ensure that the Plant Site has been graded and compacted to the base contours shown on the Contract Drawings. All areas of the Plant Site shall be compacted to 90% Standard Proctor Density with all areas of significant settling or erosion, refilled with clean imported clayey material.

Ps.7.02 MATERIAL

All material used on this Contract shall be approved by the Engineer prior to use.

a) Clay Capping Material

Clay material used for the final cap shall be clean clay soil imported from the approved borrow pit from locations as directed by the Engineer. Clay material for the lower 18 inches of the clay cap shall have a gradation of less than 18 percent of soil particles smaller than 0.005 millimeters in diameter and the top 18 inches of the clay cap shall have a gradation of more than 18 percent of soil particles smaller than 0.005 millimeters in diameter. Both materials shall have a minimum of 45 percent fines passing the No. 200 sieve (clay, classified as CL or ML under the Unified Soils Classification System or defined by ASTM D-421-58 and D-422-63 procedures).

Determination of particle size distribution for use as capping material shall be made by the Engineer at the pit at a minimum rate of one sample for each 10,000 cubic yards of material to be removed.

b) Topsoil

Topsoil shall be provided from existing stockpiles and shall meet the approval of the Engineer.

c) Sand

Sand to be used for the sand blanket between the topsoil and the clay cap shall be clean medium to coarse sand from a source approved by the Engineer.

d) Coarse Filter

Coarse filter material used for the gas vent installation shall be approved Michigan Department of Transportation coarse aggregate '6A'.

e) Medium Filter

Medium filter material used for the gas vent installation shall be Class "I" filter material.

f) Gas Vent Pipe

Fabrication of the gas venting pipe shall be as detailed on the Contract Drawings. Pipe used for the vents shall be 4" Schedule 40 steel pipe. Gas vents shall be supplied by the Owner, F.O.B. St. Louis.

g) Filter Fabric

Filter fabric shall be a plastic non-woven bonded fabric with random array of polypropylene and nylon sheath and polypropylene core filaments.

where used

Ps.7.03 GAS VENTS

Installation of the gas vents shall be carried out following capping of the Plant Site. The work shall involve installing the vents in locations shown, and as specified on the Contract Drawings.

Material excavated during the installation of the vents shall be disposed of in an area specified by the Engineer. Disposed material shall be covered immediately with 12 inches of imported clean clayey fill and compacted to 90% Standard Proctor Density.

Ps.7.04 PROOF ROLL ENTIRE SITE PRIOR TO INSTALLATION OF CLAY CAP

Prior to clay cap installation, the entire site shall be proof rolled with a proof roller of between 35 and 50 tons static weight.

Settlement or subsidence caused by proof rolling shall be filled to original ground elevation with clay fill material obtained from the approved project borrow pit compacted to 90% Standard Proctor Density.

Proof rolling shall continue until, in the opinion of the Engineer, all areas exhibit a satisfactory structural condition.

Under no circumstance shall any clay cap material be placed until such time as the area has been proof rolled to the satisfaction of the Engineer.

Ps.7.05 EXCAVATE, TRANSPORT, PLACE AND COMPACT CLAY CAP

a) Place Clay Cap

Placing of the clay cap shall begin at the upgradient side of the Plant Site and proceed downgradient. Areas on which waste material has been disposed shall be capped with a minimum of 36 inches of clay and all other areas shall have a minimum 18 inch clay. Delineation of the two areas is indicated on the Contract Drawings.

Clay shall be placed in 6 inch lifts compacted to 98% Modified Proctor Density, as outlined in ASTM 1557 at a moisture content of +1% of its optimum moisture content as determined from time to time by a materials testing engineer retained by the Owner. Determination of moisture content shall be carried out as determined by ASTM D2216.

Compaction tests and moisture density determinations shall be carried out by the Engineer of material in place at a frequency of one test for each 1,000 cubic yards of clay placed.

Water for compaction, should it be required, shall be potable water from an approved source and shall be applied at locations and rates as specified by the Engineer.

Capping material shall be tested at the pit by the Engineer. Tests to be performed are:

- i) Particulate size gradation such that more than 18% of the soil particles are less than 0.005 millimetres in diameter in the top 18" of clay cap and less than 18% are less than 0.005 millimeters in the bottom 18" of clay cap, as defined by the ASTM D-421-58, or D-422-63 as reapproved in 1972; performed on one sample for every 10,000 cubic yards of material to be placed.
- ii) Atterberg limits; performed on one sample for each 10,000 cubic yards of clay to be placed.
- iii) Plastic limit; performed on one sample for each 10,000 cubic yards of clay to be placed.
- iv) Redetermination of Proctor Density of capping material by modified Proctor as outlined in ASTM 1557 on one sample for each 5,000 cubic yards of capping material to be used, or whenever the texture of the capping material changes.

The Contractor shall assist the Engineer in obtaining all samples throughout the clay cap placement.

The finished surface of the capped site shall be smooth and free from any irregular surface changes and shall conform to the final grading plan shown on the Contract Drawings.

All clay placed shall meet compaction specifications. Should compaction specifications not be met, the affected area shall be reworked and recompact until subsequent testing confirms compliance. Clay shall not be placed until underlying lifts have been approved by the Engineer.

b) Topsoil

Following final grading of the capped site, six inches of topsoil shall be evenly and uniformly spread over the entire site preparatory to seeding and mulching. Seed and mulch shall be carried out as specified in Section Ps.8.

c) Dust Control

The Contractor shall keep the site, adjacent areas, and haul roads free from excess dust and airborne particulate matter.

As directed by the Engineer, the Contractor shall apply water or calcium chloride to work areas, access roads or County and State Highways in proportions and frequencies as approved by the Engineer.

A mechanical road sweeper shall be provided as directed by the Engineer. Collected material shall be disposed on the Plant Site as directed by the Engineer.

d) County Roads and State Highways

As a condition of this Contract, the Contractor shall limit the travel of loaded trucks or heavy equipment between the site of the work and the clay-topsoil borrow pit to the following roads:

- 1) Riverside Drive between the clay-topsoil borrow pit and Prospect Avenue.
- 2) Prospect Avenue between Riverside Drive and Main Street.
- 3) Main Street between Prospect Avenue and Washington Avenue.
- 4) Main Street between Prospect Avenue and Center Avenue (alternative).
- 5) Center Avenue between North Mill Street and Main Street (alternative).
- 6) North Mill Street between Center Avenue and North Avenue (alternative).
- 7) North Avenue between North Mill Street and Plant Site (alternative).
- 8) Washington Avenue between Main Street and Plant Site.

The Contractor shall be responsible for all cleaning, maintenance and repair to State, County, or Municipal Highways travelled by his equipment or vehicles during the course of the work.

All haul roads between the borrow pit and the site shall be maintained during the course of the work in a condition satisfactory to the Engineer and the Gratiot County Roads Commissioner. In no event shall the condition of this road cause hardship or difficulty in travel to the local residents. This requirement is of top priority and should be especially noted by the Contractor.

e) City Roads

At the completion of all Contract work on the Plant Site the Contractor shall regrade and pave city roadways adjacent to the Plant Site as shown on the Contract Drawings. The Contractor shall be responsible for supply of any additional granular fill to bring the roadways to final grade prior to paving.

All approaches to the work areas shall be signed and all warning signs shall be maintained for the duration of the road paving.

All costs involved with work discussed under this section will be paid as additional costs to the final Contract Bid Price.

f) Clay Fill and Topsoil Borrow Pit

A source of clay fill, and topsoil has been identified and secured by the Owner, and its location is indicated on the Contract Drawings.

Topsoil shall initially be stripped and stockpiled as required for further use.

Clay fill and soil excavation shall proceed in an orderly fashion and to lines and grades as approved by the Engineer.

Materials rejected at the borrow site by the Engineer shall be spoiled on site to lines and grades as approved by the Engineer.

Dewatering shall be carried out as required by the Contractor. Collected water shall be discharged to an adjacent natural watercourse in a manner satisfactory to the Engineer.

All applications, permits and fees necessary to transport topsoil, fill, and clay soil from the borrow area to the site of work shall be the responsibility of the Contractor.

The Contractor shall post and maintain road signs at the borrow pit area indicating "Caution - Trucks Turning". Signs shall be visible from both approaches to the pit area.

The Contractor shall keep all county roads free of mud, soil and other debris tracked by haulage units. Following completion of borrow operations, the borrow site shall be regraded and cleaned to the satisfaction of the Engineer. Upon approval of the final grading from the Engineer, the Contractor shall spread and fine grade six inches of topsoil and seed and mulch all disturbed areas.

All costs involved in the development, operation, maintenance (including surface and groundwater control and pit haul roads) and restoration of the borrow area shall be included in the appropriate bid unit prices for clay fill, and topsoil.

Ps.7.06 SOD DRAINAGE DITCHES

All drainage ditches shown on the Contract Drawings shall be sodded with mature nursery grown sod. Sod shall be placed sixteen feet wide centered about the centerline of the ditches with the edges countersunk to existing grade to allow water to flow across the joint at the sod/seed and mulch interface.

Ps.7.07 ON-SITE HAUL ROADS

On-site haul roads are presently located on the Plant Site as shown on the Contract Drawings. Maintenance of these haul roads and construction of any new haul roads shall be the responsibility of the Contractor. The cost of such haul road construction and/or maintenance shall be included in the Bid Prices for all work involved in the securement of the Plant Site.

Upon completion of the Plant Site encapsulation final access roads shall be constructed as detailed on the Contract Drawings. Access roads will be located to allow access to the subdrain sumps and leachate holding tank.

Ps.7.08 RIP RAP

a) General

This work shall consist of constructing a protective covering of approved stone without mortar on an earth bed along the embankment of the Pine River running along the Plant Site perimeter, and shall include the required excavating, trimming and consolidating of foundations as directed, and shall include the hauling and delivery of all rock and other material, and all labour and equipment incidental to the handling and placing.

b) Material

The quality of rock or concrete fragment shall be approved by the Engineer. Rock or concrete subject to marked deterioration by water or weather will not be accepted.

The largest rock procurable shall be supplied, generally in the 9 inch to 12 inch range, and in no case shall any fragment measure less than one cubic foot. Spalls will be acceptable to fill open joints. The largest dimension of an individual piece of rock will not be greater than twice the shortest dimension.

Field stone or boulders may be used when approved by the Engineer.

c) Construction

As directed by the Engineer, the Contractor shall excavate so as to provide an adequate foundation upon which the bottom of the rip rap shall rest and he shall fine grade to a uniform and even surface the whole area to be rip rapped. Depressions shall be filled and thoroughly compacted.

Prior to placing the rip rap a layer of filter fabric shall be laid down along the riverbank. The edge of the filter fabric shall be secured at the top of the bank as detailed on the Contract Drawings.

The rip rap shall commence in a trench below the toe of the slope. Stones shall be placed to the required length, thickness and depth conforming to the lines given by the Engineer. Stones will be set normal to the slope and placed so that the largest dimension is perpendicular to the face of the wall.

The largest stones shall be placed in the bottom courses and for use as headers for subsequent courses. No shaping of stones shall be required but the Contractor shall build to reasonable semblance of courses with stones laid closely, voids chinked with spalls.

Should fragmented concrete be used as rip-rap, any concrete with bituminous material adhering to it shall be removed prior to placement and shall be disposed of on-site as directed by the Engineer.

Ps.8 LANDSCAPING

Ps.8.01 GENERAL

The work shall consist of the supply and placement of topsoil, lime, fertilizer, grass seed and mulch over the entire area of the site as indicated on the Contract Drawings. The Contractor shall supply all labor, material and equipment necessary to fully complete this landscaping in all respects.

Ps.8.02 MATERIALS

a) Topsoil

Topsoil shall be fertile loamy material free from roots, vegetation, weeds, parts of weeds, weed seeds and other debris. The source of topsoil shall be an area free from growth of Quackgrass, Japanese Clover, Horsetail, Morning Glory, and other persistent weed plants. Topsoil should be free from stones and clods over two inches in diameter.

Topsoil shall not be obtained from swampy areas and shall not be infested with the seeds of noxious weeds. The pH of the topsoil shall be between 5.5 and 7.0.

Topsoil shall be inspected and approved by the Engineer prior to delivery to the job site. A sufficient supply of topsoil will be available from the project borrow pit.

b) Seed

Grass seed is to be obtained from a recognized seed house and shall be supplied in the following mix quantities per acre.

90 lbs. Creeping Red ^{P.} Rescue, Ruby
50 lbs. Blue Grass, Park Variety
10 lbs. White Clover
20 lbs. Perennial Ryegrass
3/4 bu. Spring Oats
30 - 40 lbs. Ammonium Nitrate

c) Fertilizer

Fertilizer shall be a standard commercial fertilizer with a ratio of 6-12-12. Fertilizer shall be stored in a dry area and shall be kept free flowing and free from lumps.

Fertilizer for top dressing shall be ammonium nitrate.

d) Water

Water used for hydraulic seeding shall be free of any impurities which would inhibit germination or otherwise adversely affect growth.

e) Mulch

Mulching material shall be oat or wheat straw free from weeds and all other foreign matter. Mulch shall be used dry.

f) Asphalt Emulsion

Asphalt emulsion to be used as an adhesive with the mulching material shall be a specially refined petroleum asphalt emulsified in water, containing no petroleum solvents or other components known to be toxic to plant life. It shall be of fluid consistency, designed for cold spray applications and shall be so manufactured and stored as to show no separation of the asphalt.

Asphalt emulsion shall conform to the following specific requirements:

Viscosity, 60 ml. @ 77°F., SSF	17 - 40
Residue by Distillation, %	55 - 58
Settlement, 7 days %	5.0 Max.
Demulsibility, 50 ml. of 0.10N CaCl ₂	2.0 Max.
Sieve Test	0.10 Max.

Tests of Residue from Distillation:

a) Penetration, 77°F., 100 g, 5 Sec.	100 - 200
b) Solubility, CCl ₄ , %	97.5 Min.
c) Ductility, 77°F., cm.	40 Min.
Fireproofness	Pass

Methods of testing shall be in accordance with ASTM Designation D244, except that for the Settlement Test the settlement period shall be 7 days, for the Solubility Test the Solvent shall be carbon tetrachloride, and the fireproofness requirement shall be met if there is no flash or flame when the flame of a bunsen burner is held in contact for 10 seconds with the surface of the material, as received.

Adhesive materials for mulch other than asphalt emulsion will be considered as alternatives upon written application to the Engineer.

Approval by the Engineer of an alternate mulch adhesive will not increase the price of the work.

g) Sod

Sod, if required, shall be mature nursery grown sod well permeated with roots. The sod shall be uniform in texture, free from weeds and be in a healthy condition with no sign of decay.

All sod is to be delivered to the job within 24 hours of being cut and shall be placed within 36 hours of being cut. The sod shall contain sufficient moisture to maintain its vitality during transportation and placement. Sod shall be sprayed with water and covered with moist burlap if required to prevent its drying out before laying.

Sod may be rolled to facilitate handling and transportation and shall be in widths not less than 12" nor more than 18", in lengths not less than 14" nor more than 6', in thickness not less than 1 1/2".

Sod shall contain Merian Blue and/or Kentucky and/or Creeping Red Rescue grasses and shall not contain more than thirty (30) percent of other common grasses.

h) Sod Pegs

Sod pegs shall be at least one inch square and 18 inches long with one end pointed.

Ps.8.03 CONSTRUCTION METHODS

a) Topsoil Placement

Prior to seeding, the Contractor shall uniformly spread topsoil over the entire work area to a depth of 6 inches. All clods and lumps shall be pulverized and any roots, foreign matter and stones larger than 2 inches in diameter shall be raked up and removed. The entire topsoil area shall be raked to a uniform finish.

b) Seeding

The grass seed and fertilizer shall be uniformly spread over the entire work area with an approved hydraulic seeder. The quantities of materials to be charged into the seeder shall be measured by weight or by a system of weight-calibrate volume. The Contractor shall provide all equipment for this purpose.

No area shall be seeded which cannot be mulched on the same day as it is sown.

Seeding is to be completed prior to September 1 of any given year.

c) Mulching

Mulch material shall be applied with an approved mulch blower and shall be sufficiently dry that it can be processed through the blower without stoppage.

Mulch shall be applied evenly over all seeded areas at the rate of 2.5 tons per acre.

To facilitate tying the mulch down, asphalt emulsion shall be sprayed into the air stream of the mulch blower at a rate sufficient to form an effective, cohesive mat. The emulsion application rate shall not be less than 150 gallons per acre. The emulsion shall be distributed uniformly throughout the mulch material by not less than two nozzles.

d) Placing of Sod

Before placement of sod, if required, fertilizer is to be uniformly applied at a rate of 500 lbs. per acre. This shall be incorporated into the topsoil by raking, discing or harrowing. Fertilizer shall be applied not more than 48 hours before the sod is placed.

Sod shall be neatly and evenly placed so that the appearance on completion shall be as nearly as possible that of a good natural growth in place. Where sodding meets seeded areas, the sod shall be countersunk to the existing grade level at the edges to permit the free flow of water across the joint.

e) Pegging Sod

On slopes, sod shall be laid lengthwise across the face of the slope with the ends close together. Joints in adjacent rows shall be staggered. Joints and broken sod shall be pounded to a uniform surface. On slopes 3:1 and steeper, sodding shall be pegged as follows:

On slopes steeper than 1 3/4:1 each and every row of sod shall be pegged; on slopes from 1 3/4:1 to 3:1 each of the bottom three rows and each third row above shall be pegged.

In a pegged row of sod, the pegs shall be uniformly spaced across the face of the slope at uniform intervals of not greater than 24" such that when the sods therein are:

- (a) 24" or less in length, there shall be a peg in each sod.
- (b) greater than 24" but not greater than 48" there shall be two pegs in each sod.
- (c) greater than 48" but not greater than 72" there shall be three pegs in each sod. The pegs shall be driven flush with the sod.

The Contractor shall water the sod as required to establish good growth. Water shall be applied in a manner that the newly sodded surface shall not be eroded, washed out or damaged in any way. No additional payment shall be made for watering of the sod.

f) Fertilizing

300 lbs. per acre of fertilizer is to be thoroughly disced into the surface of the topsoil prior to seeding.

Weed killer will be applied only as required, and approved, by the Engineer.

g) Overlap

Where the work adjoins existing vegetation the Contractor shall overlap the seed and mulch material to bond the new growth intimately to the existing growth.

h) Weather and Seasonal Conditions

Work shall only be done when the ground is free of snow, ice or standing water and when the opinion of the Engineer, weather and seasonal considerations are suitable. Work will not be permitted to proceed when wind conditions are such that material would be carried beyond the designated work area or that materials would not be uniformly applied.

Ps.8.04 TESTING

Materials shall be tested to confirm compliance with specifications at a frequency as determined by the Engineer. Upon request, the Contractor shall submit to the Engineer samples in volumes and containers as directed.

The cost of initial or primary testing shall be borne by the Owner. Should it be necessary to conduct subsequent testing due to initial non-compliance of samples with specification, all cost of such testing shall be the responsibility of the Contractor.

Ps.8.05 MAINTENANCE

The Contractor is responsible for establishing vegetative cover and shall re-seed any areas that do not properly take or are not adequately covered.

Maintenance shall continue until preliminary acceptance of the entire project, and shall include watering, mowing, and any other operations, including re-seeding as necessary to produce a close stand of grass over the entire designated area.

In no event will acceptance for this portion of the work be granted until establishment of vegetative cover and after second cutting.

Ps.9 HEALTH AND SAFETY

Ps.9.01 SCOPE

The installation of the Upgradient Containment Wall and the internal groundwater collection system shall involve excavation into soils and groundwater that may contain chemical materials including pesticides, brominated and chlorinated hydrocarbons, and organic solvents. The Contractor shall submit with his Bid, a Project Health and Safety Plan, which will be reviewed by the Engineer and the Owner. The successful Bidder shall not commence work until his Health and Safety Plan has been reviewed and approved by both the Engineer and Owner, and until all provisions of the Health and Safety Plan are in effect.

The Health and Safety Plan shall provide for a safe and minimal risk working environment for on-site personnel and shall minimize the impact of construction activities on the general public and the surrounding environment. The development and maintenance of the Project Health and Safety Plan is the Contractor's responsibility. However, as a minimum, the plan shall submit and address the specifications contained hereafter.

The Contractor shall include with his Health and Safety Plan a breakdown of all equipment and utilities he proposes to furnish during the construction project.

Ps.9.02 BASIS

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) shall provide the basis for the safety and health program. The program shall also reflect the position of both EPA and NIOSH regarding procedures required to insure safe operations at sites containing hazardous or toxic materials.

The safety and health of the public and on-site personnel, and the protection of the environment shall take precedence over cost and schedule considerations for all project work. The Owner's on-site representative, the Engineer, and the Contractor's Safety Officer shall be responsible for decisions regarding when work shall be stopped or started for health or safety considerations.

Ps.9.03 SAFETY OFFICER

The Contractor shall provide a designated site Safety Officer who shall have a minimum of three years working experience in the chemical and chemical waste disposal industry, and who shall have a sound working knowledge of State and Federal occupational safety and health regulations and formal educational training in occupational safety and health.

The Safety Officer shall:

- a) Be responsible for the implementation, enforcement and monitoring of the safety and health plan;
- b) Ensure that all on-site personnel have obtained the required medical examinations prior to and at the termination of work;
- c) Be responsible for the pre-construction indoctrination of all on-site personnel with regard to this safety plan and other safety requirements to be observed during construction, including: (i) potential hazards, (ii) personal hygiene principles, (iii) personnel protective equipment, (iv) respiratory protection equipment usage and fit testing, and (e) emergency procedures dealing with fire and medical situations;
- d) Be responsible for alerting appropriate off-site emergency services and the Engineer before starting any particularly hazardous work; and
- e) Be responsible for the maintenance of separation of "Contaminated" (Dirty) and "Uncontaminated" (Clean) areas as described hereafter.
- f) Preparation and maintenance of an emergency contingency plan.

Ps.9.04 MEDICAL SURVEILLANCE

The Contractor shall retain the services of an occupational physician to provide the medical examinations and surveillance specified herein. The name of the physician and evidence of examination of all on-site personnel shall be provided to the Owner prior to assigning personnel on-site.

All on-site personnel involved in this project shall be provided with medical surveillance prior to the onset of work, at the conclusion of the project, and at any time there is suspected excessive exposure to toxic chemicals or physical agents.

Medical surveillance protocol is the physician's responsibility but shall meet the requirements of OSHA standard 20 CFR 1910.134 for all personnel. Normally this would include:

- a) Baseline Examination: Medical history; general physical; EKG; SMA 26; urinalysis; serum cholinesterase; methemoglobin; urine heavy metals; and chest x-ray.
- b) Follow-up Examination: SMA 26; CBC; urinalysis; serum cholinesterase; urine heavy metals; and methemoglobin.

The Contractor shall maintain all medical surveillance records and make these records available to the Owner. These records shall be maintained for a period of twenty (20) years.

Ps.9.05 TRAINING

The Contractor shall provide and require that all personnel assigned to or entering the site, complete training or refresher sessions totalling a minimum of 8 hours. Training and refresher sessions shall ensure that all personnel are capable of and familiar with the use of safety, health, respiratory and protective equipment and with the safety and security procedures required for this site.

The Safety Officer shall be responsible for ensuring that personnel not successfully completing the required training are not permitted to enter the site to perform work.

Exceptions to the above shall be made only by the Owner's on-site representative or the Engineer for authorized visitors.

Ps.9.06 RESPIRATOR PROGRAM

All on-site personnel shall receive extensive training in the usage of, and be fit tested for, both half and full face respirators. This shall include canister/cartridge and supplied air types.

The respirator program shall be administered by the Safety Officer.

Ps.9.07 WORK AREAS

The Contractor shall clearly layout and identify work areas in the field and shall limit equipment, operations and personnel in the areas as defined below.

- i) "Dirty" Area (Hazardous Work or Contaminated Zone) - This shall include all areas where contaminated soils are being excavated, handled, spoiled or covered, and all areas where contaminated equipment or personnel travel. For purposes of this Contract, the dirty area shall be deemed to include all lands within the Velsicol property boundaries.

The level of personnel protective equipment required in this area shall be determined by the Safety Officer, the Engineer, and Owner's on-site representative after monitoring and on-site inspection.

- ii) Decontamination Zone - This zone shall occur at the interface of "Dirty" and "Clean" areas and shall provide for the transfer of construction materials from clean to site dedicated equipment, the decontamination of equipment and vehicles prior to entering the "Clean" Area, the decontamination of personnel and clothing prior to entering the "Clean" Area, and for the physical segregation of the "Clean" and "Dirty" Areas.
- iii) "Clean" Area - This area is the remainder of site and is defined as being an area outside the zone of significant air, soil or surface water contamination. The "Clean" Area shall be clearly

delineated and procedures implemented to prevent active or passive contamination from the work site. The function of the "Clean" Area includes:

- 1) An entry area for personnel, material and equipment to the "Dirty" Area of site operations;
- 2) An exit area for decontaminated personnel, materials and equipment from the "Dirty" Area of site operations;
- 3) The housing of site special services; and
- 4) A storage area for clean safety and work equipment.

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The "Dirty Area" shall be clearly delineated in the field by the existing boundary fenceline. In areas where the boundary fenceline is removed, the Contractor shall erect temporary fencing to delineate the dirty zone. Haul roads within the Plant Site boundary deemed to be clean shall be delineated from the Dirty Zone using stakes and flagging. All site dedicated equipment shall be prohibited from travelling on clean haul roads.

Ps.9.08 SECURITY

The Contractor shall provide a Security Officer(s) at site entrances currently being used. The Security Officer(s) shall:

- a) provide and maintain site security during working hours
- b) limit vehicular access to the site to authorized vehicles and personnel only
- c) maintain a visitors and site personnel sign-in sign-out log, and a log of all security incidents
- d) provide initial screening of site visitors
- e) post and maintain all required signs

Ps.9.09 EMERGENCY AND FIRST AID EQUIPMENT AND SUPPLY

The Contractor shall provide an emergency medical facility in the decontamination zone. This facility is described in Section Ps.10.02.

The safety equipment listed below shall be located and maintained within the "Dirty" Area in appropriate locations as directed by the Safety Officer.

- i) portable emergency eye wash and showers
- ii) stretchers

- iii) twenty pound ABC type dry chemical fire extinguishers
- iv) self contained air full face respirators

As a minimum the Contractor shall have one Certified First Aid Technician on-site at all times.

Ps.9.10 EMERGENCY CONTINGENCY AND RESPONSE PLAN

a) Off-Site Contingency Plan

Prior to commencing work, the Contractor shall co-ordinate the development of an off-site emergency contingency plan. This plan is intended to provide immediate response to a serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from the site into adjacent public areas.

Co-ordination meetings shall be held with appropriate authorities including the City, Engineer, Fire, Hospital, State and City Police, State Department of Transportation, and Civil Defence officials. The meetings shall identify the Emergency response co-ordinator through whom all information and co-ordination will occur in the event of an incident. Plans shall be developed, or existing plans incorporated into the master plan, for

- i) mass evacuation of adjacent areas
- ii) massive fire fighting procedures
- iii) mass transport of injured personnel to medical facilities
- iv) priority transportation routes
- v) co-ordination and/or modification of highway operations.

Techniques and recommended procedure for immediate first aid emergency response shall be developed with local medical facilities.

b) On-Site Contingency Plan

- i) Procedures and protocols for the immediate handling and treatment of injured on-site personnel shall be developed and submitted to the Engineer for approval prior to commencing site work.
- ii) Fire fighting equipment shall be maintained in strategic locations within the site to combat localized fires. Personnel shall be trained in fire fighting procedures and shall be equipped with self contained air respirators when involved in such operations.

- iii) In the event of significant release of toxic or hazardous vapors from any excavation, the source of such vapors shall be immediately backfilled or covered with fill. Alternate plans of contaminant removal shall be developed and submitted to the Engineer prior to recommencing work in the area.

Ps.9.11 PERSONAL SAFETY AND RELATED EQUIPMENT

The Contractor shall provide all on-site personnel with appropriate personal safety equipment and protective clothing. The Contractor shall ensure that all safety equipment and protective clothing is kept clean and well-maintained. As a minimum, the Contractor shall supply:

- a) Work clothing (pants, shirt, socks, underwear)
- b) Disposable outerwear such as coveralls, gloves, hardhat liners, and foot coverings. Coveralls shall be impervious
- c) Hardhats
- d) Safety shoes or boots
- e) Rubber overshoes or overboots
- f) Full and/or face respirator with dual high efficiency organic vapor, acid gas and particulate filters; self-contained breathing apparatus or other supplied air system as necessary to conduct remedial action in a safe manner.

Protective equipment usage procedures shall be developed by the Contractor. These requirements shall contain, but not be limited to, the following:

- 1) All prescription eyeglasses in use on the site shall be safety glasses.
- 2) Respirator filters shall be changed daily or upon breakthrough, whichever occurs first.
- 3) Coveralls and gloves shall be tightly secured to other clothing (by tape, for example) to minimize worker exposure to toxic material.
- 4) All disposable or reusable gloves worn on the site shall be approved by the Safety Officer. Inner gloves shall be disposable latex.
- 5) Footwear used on-site shall be steel-toed safety shoes or boots, with chemical resistant soles, and shall be covered by rubber overshoes when entering or working in the "Dirty" Area or Decontamination Zone.

- 6) All on-site personnel shall wear an approved hardhat when present in the "Dirty" Area.
- 7) All personal protective equipment worn on-site shall be decontaminated at the end of the work day. The Safety Officer will be responsible for ensuring all personal protective equipment is decontaminated before being reissued.

Ps.9.12 RESPIRATORY PROTECTION

The Contractor shall monitor, evaluate, and provide respiratory protection for all on-site personnel.

The Contractor shall develop and submit a respiratory protection program for approval to the Engineer prior to commencing on-site work. As a minimum, the Contractor's respiratory protection program shall conform to the Velsicol guidelines contained within Appendix A.

The Safety Officer shall be responsible for implementing, maintaining and enforcing the respirator program.

On-site personnel unable to pass a respiratory fit test shall not enter or work in the "Dirty" Area or Decontamination Zone.

Ps.9.13 PERSONAL HYGIENE

The Contractor shall be responsible for, and ensure that all personnel performing or supervising remedial work within a potentially contaminated work area, or exposed or subject to exposure to hazardous chemical vapors, liquids, or contaminated solids, observe and adhere to the personal hygiene-related provisions of this section.

On-site personnel found to be disregarding the personal hygiene-related provisions of this plan shall, at the request of the Owner's on-site representative, the Engineer, or site Safety Officer, be barred from the site.

The Contractor shall provide, as a minimum, the following for the personal hygiene of all on-site personnel.

- a) Suitable disposable outerwear, gloves, hardhat liners, and footwear on a daily basis for the use of on-site personnel and visitors.
- b) Contained storage and disposal for used disposable outerwear.
- c) Shower facilities for all on-site personnel.
- d) Hand washing facilities.

- e) A facility for changing into and out of and storing work clothing separate from street clothing.
- f) A lunch and/or break room.
- g) A smoking area.

The Contractor shall also include and enforce the following provisions:

- i) On-site personnel shall wear disposable outerwear, gloves, and outer footwear at all times whenever entering or working in the "Dirty" Area or Decontamination Zone.
- ii) Used disposable outerwear shall not be reused, and when removed, shall be placed inside disposable containers provided for that purpose.
- iii) Smoking shall be prohibited except in a designated smoking area.
- iv) Eating and drinking shall be prohibited except in a designated lunch or break area.
- v) Soiled disposable outerwear shall be removed prior to entering the lunch area, and prior to cleansing hands.
- vi) On-site personnel shall thoroughly cleanse their hands and other exposed areas before entering the smoking or lunch area.
- vii) All personnel working in the "Dirty" Area or Decontamination Zone shall shower and change to fresh clothing after each working period or shift, prior to leaving the site.
- viii) Used work clothing shall be laundered daily in a facility provided by the Contractor within the decontamination zone. Wash water shall be disposed of on-site as directed by the Engineer.

Ps.9.14 AIR MONITORING

During active phases of work under this Contract, the Owner shall perform boundary particulate air monitoring at six locations adjacent to the Plant Site. The results of such monitoring shall be utilized to evaluate and modify the Contractor's particulate emission control program, described in Section Ps.9.15. Velsicol shall monitor excavation and spoils areas on a periodic basis by Draeger tube for the following compounds;

- i) Benzene
- ii) Carbon tetrachloride
- iii) Phenol
- iv) Chloroform
- v) 1,2-Dichloroethane

In addition, Velsicol shall maintain continuous recording of windspeed, and wind direction at one location adjacent to the Plant Site.

During the progress of active remedial work, the Contractor shall monitor the quality of the air in and around each active work location. Sampling shall be conducted on a regular periodic basis, and additionally as required by special or work-related conditions. The Contractor by downwind air sampling shall monitor air leaving the active work locations. Air sampling shall be conducted for gases, particulates and vapors. Any departures from general background shall be reported to the Engineer who will in conjunction with the Safety Officer and the Owner's site representative determine when operations should be shut down and restarted.

Instruments required, and provided by the Contractor for air monitoring shall include an organic vapor photoionizer, personal respirable dust monitors, and a detector for alpha, beta, and gamma radiation. Velsicol shall make available to the Contractor a two station organic vapor analyzer in good operating order for explosivity/flammability monitoring. Operation, maintenance, and post-construction overhaul shall be the responsibility and cost of the Contractor; however for training purposes Velsicol shall have on-site personnel experienced in the operation and maintenance of this equipment. Copies of the organic vapor analyzer print-out shall be provided daily to the Engineer.

Contractor air monitoring equipment shall be operated by personnel trained in the use of the specific equipment provided and shall be under the control of the site Safety Officer. A log of the location, time, type, and value of each reading and/or sampling shall be maintained. Copies of daily log sheets shall be included with the daily report to the Engineer.

Should the organic vapor level in any active working location exceed 100 ppm for any single reading, or 50 ppm for any two successive readings, or should the explosimeter indicate in excess of 20 percent of the lower explosive limit on any single reading, then that work location shall be shut down and evacuated upwind. Work shall not resume at such a work location until authorized by the Owner's on-site Supervisor and/or site Safety Officer.

A wind direction indicator shall be installed by the Contractor at each active work location.

Ps.9.15 CONTAMINANT MIGRATION CONTROL

All vehicles and equipment used in the contaminated areas shall be decontaminated to the satisfaction of the Engineer and Owner prior to being removed from site.

A decontamination wash facility with limited storage capacity for wash waters exists near the North Street entrance to the site. All equipment and vehicles shall be decontaminated at this facility.

The Contractor shall provide sufficient cleaning units to provide efficient hot water high pressure cleaning of equipment.

Wash waters shall be removed by the Contractor from the decontamination facility tank on an as required basis and transported and discharged to the on-site holding tank. Final disposal of accumulated wash waters shall be the responsibility of the Owner.

Personnel engaged in vehicle decontamination shall wear protective equipment including disposable clothing and respiratory protection.

Ps.9.16 PARTICULATE EMISSION CONTROL

During remedial action, the Contractor shall implement and enforce a dust control program to minimize the generation and off-site migration of fugitive particulate emissions.

All roadways, designated work areas and other possible sources of dust generation shall be controlled by application of water or calcium chloride solution, as directed by the Engineer.

Personnel respirable dust monitors shall be utilized to monitor the on-site levels of dust generation. Departures from general background shall be reported to the Engineer who shall initiate the appropriate action including work stoppage to reduce dust emissions to an acceptable level.

Ps.9.17 POSTED REGULATIONS

The Contractor shall post signs at the site entrance and on the perimeter of the "Dirty" Area which state "Warning, Hazardous Work Area, Do Not Enter Unless Authorized". In addition, a notice directing visitors to the Security Officer shall be posted at the site entrance.

Safety regulations and safety reminders shall be posted at conspicuous locations throughout the site. All regulations shall be approved by the Owner and the Engineer prior to being posted.

Ps.9.18 SAFETY MEETINGS

The Safety Officer shall conduct weekly safety meetings which shall be mandatory for all site personnel. The meetings shall provide refresher courses for existing equipment and protocols, and shall examine new site conditions as they are encountered.

Additional safety meetings shall be held on an as required basis.

Should any unforeseen or site peculiar safety related factor, hazard, or condition become evident during the performance of work at this site, it shall be the Contractor's responsibility to bring such to the attention of the Engineer and Owner in writing as quickly as possible, for resolution. In the interim, the Contractor shall take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

Ps.10 TEMPORARY FACILITIES

Ps.10.01 GENERAL

The Contractor shall furnish the temporary structures and facilities detailed herein, at locations approved by the Engineer and Owner. All structures installed under this section shall be removed by the Contractor at the completion of the Project.

The Contractor shall provide temporary on-site facilities for the following:

- a) Emergency First Aid Facility
- b) Equipment Storage
- c) Personnel hygiene

Floor plans, proposed fixtures, materials of construction and proposed siting locations shall be submitted to, and receive approval from, the Engineer prior to erection of facilities at the site.

All areas specified herein shall be located within the "Clean" Area with the exception of the emergency medical, and personnel decontamination facilities which shall be located within, and straddle, both the "Clean" and "Dirty" Areas.

In conjunction with the temporary facilities the Contractor shall construct and maintain a granular access road from the North gate of the Plant Site to the area of the temporary facilities.

Ps.10.02 EMERGENCY FIRST AID FACILITY

The Contractor shall provide an emergency first aid facility. This facility shall be adjacent to and connect with the personnel decontamination facility. The structure shall contain the following equipment and supplies:

- a) Stretcher;
- b) One set of crutches;
- c) Two self contained air respiratory devices;
- d) One counter and sink with running potable water;
- e) One Cot;
- f) Blankets and towels as required;
- g) First aid medications appropriate for the initial treatment of burns, abrasions, fractures, and ingestion or dermal contact with on-site hazardous waste;

Ps.10.03 PERSONAL HYGIENE FACILITY

The Contractor shall provide the equipment and facilities listed below in order to provide for the proper hygiene of all on-site personnel.

The Contractor shall maintain and supply all facilities in a clean condition. Drain water from all washing facilities shall be conveyed

to a temporary on-site holding tank. These wash waters shall be collected and transported to the main, on-site holding tank, by the Contractor on a daily basis or more frequently if need should arise. Final disposal of wash waters shall be the responsibility of the Owner. Sanitary waste from toilets shall be conveyed to a separate holding tank which shall be emptied on a periodic basis and discharged to the municipal sewerage system. Alternatively, sanitary facilities may be discharged directly to the City sewer system if approval of the City is acquired by the Contractor.

The personal hygiene facility shall contain:

- a) Shower facilities with at least one shower for every six (6) on-site personnel;
- b) Locker room with one locker for each on-site personnel;
- c) A room where on-site personnel can eat;
- d) A room where all personnel safety equipment and protective clothing can be stored;
- e) Laundry area equipped with automatic washing and drying machines;
- f) Boot rack for washed boots to drain;
- g) Toilet facilities with at least one toilet and hand basin for every six (6) on-site personnel;
- h) Sanitary waste and wash water waste holding tanks and piping from Personnel Hygiene Facility. The sanitary waste holding tank may be omitted if a direct connection to the City sewer system is permitted.

Ps.10.04 EQUIPMENT STORAGE

A partitioned equipment storage area shall be provided and shall have access through a lockable door. Sufficient shelving shall be installed for storage and inventory control of small items. In addition, this area shall contain one four drawer lockable filing cabinet and a wooden lockable locker sufficient for the storage of surveying and testing instruments. Keys for the storage area shall be distributed by the Contractor to personnel approved by the Owner and Engineer.

Ps.11 ON-SITE MAINTENANCE

Ps.11.01 SUPPLY TANKER TRUCK

The Contractor shall supply a mechanically sound tanker truck of sufficient capacity to facilitate removal of accumulated wash waters from the decontamination area to the Plant Site holding tank. The Owner shall be ultimately responsible for disposal of leachate from the holding tank to the deep well. All valves, piping, pumps and other equipment shall be watertight to prevent leakage of collected leachate.

The Contractor shall make all provisions necessary to ensure proper access for the tanker truck to all points of collection and disposal.

The tanker truck shall be thoroughly decontaminated following each use if not exclusively dedicated to this project.

Ps.11.02 COLLECT AND DISPOSE OF DEBRIS

Due to the nature of material disposed of on the Plant Site small pockets of rubble and debris should be expected by the Contractor in the form of concrete and structural steel.

The Contractor shall excavate the debris, break or cut it up into manageable size pieces and dispose on the Plant Site in an area designated by the Engineer. Disposed debris shall be covered with a minimum of 12 inches of clean fill compacted to 90% Standard Proctor Maximum Density.

Ps.11.03 CONSTRUCT SEDIMENTATION CONTROL STRUCTURES

Sedimentation control structures shall be installed and maintained along the Pine River embankment as directed and approved by the Engineer. In general, a 6 inch thick mat of hay or straw shall be placed and staked along the entire river side perimeter, 10 feet from the top of the embankment. At each off-take ditch outlet, weirs consisting of rectangular bales of straw and pea gravel shall be constructed and maintained throughout the duration of the project, as directed by the Engineer. At such time that a strong vegetative cover is established over the entire plant site, the structures shall be removed and disposed of as directed by the Engineer.

Ps.11.04 EXCAVATE, LOAD, TRANSPORT AND COMPACT CLAY FILL OVER SPOILS

All material which is deemed to be unsuitable for use as backfill shall be disposed of on-site in areas designated by the Engineer.

Prior to the end of each working shift all disposed spoils shall be covered with 12 inches of clean fill material, obtained from the project borrow pit, and compacted to 90% Standard Proctor Density placed in 6 inch maximum lifts.

Ps.11.05 PROVIDE MECHANICAL ROAD SWEEPER

The Contractor shall supply a mechanically sound road sweeper capable of removing loose particulate matter from asphalt roadways.

The sweeper shall be capable of collecting and retaining all sweepings with a minimum of dust.

The sweeper shall be fitted with a misting attachment capable of spraying a fine mist of water over areas to be swept. All sweepings shall be disposed of on-site in areas designated by the Engineer.

Ps.11.06 SUPPLY AND INSTALL 8' HIGH 2" x 2" CHAIN LINK SECURITY FENCE

New 8' high industrial grade security fencing shall be erected along the entire upgradient Plant Site perimeter at the conclusion of interior Plant Site works.

a) Materials

i) Fabric

The fabric shall be No. 9 gauge steel wire woven in a 2 inch mesh and hot dipped galvanized. The mesh shall be twisted and barbed on the top selvage and knuckled on the bottom selvage. Fabric shall be fastened to posts with No. 6 aluminum bar bands spaced approximately 12 inches apart and to top rail with 9 gauge wires spaced approximately 18 inches apart.

ii) Posts and Rails

Line posts shall be hot dipped galvanized size SP3 steel pipe. Terminal posts shall be hot dipped galvanized size SP4 steel pipe supported appropriately by horizontal pipe braces and truss rods. Braces and top rail shall be hot dipped galvanized 1.90 inch O.D. steel pipe. Gates posts shall be hot dipped galvanized size SP6 steel pipe. Spacing of posts shall not exceed 10 feet.

iii) Gates

Gate frames and center stays shall be hot dipped galvanized size SP3 pipe with heavy malleable iron or pressed steel corner fittings securely riveted. Fabric to match the fence shall be installed in the frame by means of tension bars and hook bolts. Each frame shall be equipped with adjustable

truss rods. Hinges shall be offset. Hingest and truss support system shall be the manufacturer's standard design for the gate size. Latching device shall be the manufacturer's standard with provision for padlocking. All gates shall be provided with catch and semi-automatic outer catches to secure gates in opened position.

iv) Miscellaneous Fittings

The chain link wire fabric shall be securely fastened to all terminal posts by 1/4 inch x 3/4 inch tension bars with heavy No. 11 gauge pressed steel bands spaced approximately 12 inches apart.

b) Fence Erection

The fence shall be erected at locations as indicated on the Contract Drawings or as specified by the Engineer. Extreme care shall be exercised in order to ensure that the fence is erected in a straight line from corner to corner. No tolerance will be allowed.

All posts shall be set to a depth of 3.5 feet. After setting and plumbing the posts, the post holes shall be filled with 2,500 psi concrete. The top surface of the concrete shall be crowned to shed water.

At each terminal post horizontal cross bracing shall be placed using the same piping as used for the top rail. The top rail shall extend through all line posts to form a continuous brace from end to end of each stretch of fence, be securely fastened at the end of each run, and have joints made with expansion sleeve couplings not less than 6 inches long.

At the northeast and northwest corners of the Plant Site the fence shall be extended a minimum of 10 feet into the River to preclude entry along the River bank.

Ps.11.07 EXCAVATE TEMPORARY EASEMENT

At the completion of all activities prior to demobilization the Contractor shall excavate material within the 50 foot temporary area, on which the temporary facilities are located, to a depth of 12 inches. All excavated material shall be disposed on the Plant Site in an area designated by the Engineer. The disposed material shall be compacted to 90% Standard Proctor Density and capped with 36 inches of clay compacted to 98% Standard Proctor Density.

The disposed area shall be covered with 6 inches of topsoil and vegetated to match the remainder of the Plant Site.

METHOD OF PAYMENT

Mp.1

GENERAL

The Form of Bid and Additional Unit Prices are to be used as a basis of payment only and shall not be used as a description of the full extent of the work required to be performed under this Contract. All work specified on the Contract Drawings and in the Specifications must be included in the appropriate items in the Form of Bid. The method of payment for each of the bid items will be as outlined in this section. Items not specifically listed in the Form of Bid or outlined in the Method of Payment shall be included in the appropriate Unit Prices for full and complete performance of the work.

Mp.2 **PROJECT START-UP**

Mp.2.01 **MOBILIZATION**

1. Payment for mobilization will be made at the lump sum bid stipulated in the Form of Bid for Item A-1 which price and payment shall be full compensation for movement of all equipment and materials to the site of work, including all necessary permits; supply and installation of Contractor required facilities including buildings, storage areas and trailers; supply and installation of Contractor required services including telephone, power, water and sanitary facilities; construction and assembly of bentonite slurry mixing facilities; providing a suitable water supply; delivery and storage of bentonite; and all other activities or costs associated with project start-up not paid for under other Items.

Mp.2.02 **MEDICAL SURVEILLANCE**

1. Measurement for medical examinations will be made at the actual number of on-site personnel, not to exceed 20, who have received Baseline and Exit medical examinations in accordance with the approved medical surveillance protocol established in accordance with Section Ps.9.04 as determined by the Owner.
2. Payment for the quantity determined above will be made at the unit price per person bid in the Form of Bid for Item A-2 which price and payment shall be full compensation for providing Baseline and Exit medical examinations in accordance with established protocol for up to 20 personnel. The Contractor shall include in these personnel 5 non-Contractor personnel. Medical examinations for Contractor personnel exceeding 15 will be at the Contractor's expense, unless otherwise approved by the Owner in writing. Interim medical examinations required because of on-site accidents or other causes resulting from Contractor's operations shall be at the Contractor's expense.

Mp.2.03 **INSURANCE & BONDS**

1. Payment for insurance and bonds, will be made up to the value of the lump sum bid in the Form of Bid for Item A-3 which price and payment shall be full compensation for furnishing all insurance and bonds, required of in these Contract Documents and as required by all Federal, State and local agencies having jurisdiction over this work. Payment will be made on the basis of documentation in the form of receipted invoices provided to the Engineer.

Mp.3 DOWNGRADIENT CONTAINMENT WALL

Mp.3.01 WORKING PLATFORM

1. Measurement for construction of a level working platform will be made in cubic yards at the actual number of cubic yards of clay material placed as indicated on the Contract Drawings.
2. Payment for the quantity determined above will be made at the unit price per cubic yard bid in the Form of Bid for Item B-1, which price and payment shall be full compensation for excavation and transport of clay material to the site; placing the platform a minimum of two feet thick with clay obtained from the project borrow pit and compaction to a density not less than 98% Standard Proctor Density; disposal of all excavated spoils on the Plant Site; excavating the upgradient working platform at the north and south end of the site to the required downgradient elevation; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.3.02 CONTROL BERM

1. Measurement for construction of a clay control berm along the Pine River will be made in cubic yards at the actual number of cubic yards of material placed as indicated on the Contract Drawings and as directed by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per cubic yards bid in the Form of Bid for Item B-2, which price and payment shall be full compensation for construction of, a clay control berm between the working platform and the Pine River; excavation, transport, place and compact clayey fill from the project borrow pit; and all other miscellaneous items for which separate payment is not provided under other items.
3. Payment shall also include the removal and spreading of the berms subsequent to construction of the downgradient wall.

Mp.3.03 CONTAINMENT WALL

1. Measurement for construction of the downgradient containment wall will be made in square feet at the actual number of square feet constructed as determined by multiplying the length of the wall installed by the vertical distance measured from the base of the containment wall to the top of the working platform, measured along the centerline of the trench excavation at 25 foot intervals as determined by the Engineer.

2. Payment for the quantity determined above will be made at the unit price per square feet bid in the Form of Bid for Item B-3, which price and payment shall be full compensation for furnishing, placing and constructing the downgradient containment wall as detailed on the Contract Drawings including maintenance of the existing plant boundary chain link fence for the duration of the Contract; disposal of excavated spoils from trench; protection of mixed slurry should temperatures drop below 35°F; overexcavation; disposal of all excess slurry at the completion of construction; excavate, transport and compact clay cap over completed containment wall to 90% Standard Proctor Density; and all other miscellaneous items for which separate payment is not provided under other Items.
3. Payment for disposal of spoils and covering disposed spoils with clean clay fill will be made under Bid Item B-6 and G-3 respectively.

Mp.3.04 BORROW MATERIAL

1. Measurement for imported fill material will be made in bank cubic yards determined from field cross-sections of the clay borrow pit prior to and subsequent to clay excavation and delivered to the Plant Site for use as backfill mix for the containment wall as directed by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per bank cubic yards bid in the Form of Bid for Item B-4, which price and payment shall be full compensation for excavating, transporting and mixing the imported backfill with the bentonite slurry; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.3.05 QUALITY CONTROL TESTING

1. Payment for the supply of Quality Control Testing by the Contractor will be made at the lump sum price bid in the Form of Bid for Item B-5 which price and payment shall be full compensation for furnishing and implementing a Quality Control Testing program to monitoring the quality of all construction materials and practices using the sampling methods specified in Section Ps.3.04.

Mp.4 HEALTH, SAFETY AND PERSONNEL HYGIENE

Mp.4.01 SPECIFIED SITE PERSONNEL

1. Measurement for specified site personnel will be made in working days (Items C-1 and C-2) for the actual number of days worked as determined and authorized by the Engineer. A work day is defined as any working day of 8 hours or more duration.
2. Payment for specified site personnel will be made for the quantities determined above at the respective unit price per working day bid in the Form of Bid for Items C-1 and C-2 which price and payment will be full compensation for providing personnel, all salaries, wages, benefits, taxes, uniforms and all other miscellaneous items not paid for under other Items.

Mp.4.02 PERSONNEL HYGIENE FACILITY

1. Payment for the Personnel Hygiene Facility will be made at the lump sum price bid in the Form of Bid for Item C-3 which price and payment will be full compensation for installing, and maintaining the facility on-site complete as specified in Section Ps.10.03; furnishing and installing sanitary water, and electric servicing; collection and discharge of wash waters to the on-site holding tank; supply of soap, toilet paper, towels and other items required for washing and hygiene; supply and laundering of site dedicated work clothing; and all other miscellaneous items for which separate payment is not provided under the Items. Also included is the removal and disposal of sanitary waste from the sanitary holding tank as required if direct connection is not made to the City sewer system.

Mp.4.03 LUNCH ROOM AND EQUIPMENT STORAGE

1. Payment for Lunch Room and Equipment Storage Area will be made at the lump sum price bid in the Form of Bid for Item C-4(a) which price and payment shall be full compensation for furnishing, installing, and maintaining the structure on-site complete as specified in Section Ps.10.03 and Ps.10.04 including all furnishings and equipment; supply and maintenance of shelving for inventory control; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.4.04 EMERGENCY FIRST-AID FACILITY

1. Payment for Emergency First Aid Facility will be made at the lump sum price bid in the Form of Bid for Item C-3(b) which price and payment shall be full compensation for furnishing, installing, and maintaining the structure on site complete as specified in Section Ps.10.02 including all furnishings and equipment; supply and maintenance of all medical equipment and supplies, and all other miscellaneous items for which separate payment is not provided for under other Items.

Mp.4.05 SAFETY APPAREL AND EQUIPMENT

1. Measurement for personal safety equipment and protective clothing will be made on a per person on-site basis at the actual number of on-site personnel issued safety equipment and protective clothing.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item C-5 which price and payment shall be full compensation for supplying on-site personnel with items in new condition in accordance with the Safety and Health Plan outlined in Section Ps.9; maintenance of equipment on a daily basis; replacement of disposable equipment, as required; replacement of contaminated equipment or clothing; maintenance of self contained air supplies; drumming and disposal on-site of discarded equipment or clothing; and testing of equipment as directed by the Engineer.
3. Payment will be made for up to 15 Contractor's personnel. Clothing and equipment for additional Contractor's personnel will be at his own expense. Payment for Owner's and Engineer's personnel will be made on an as required basis as authorized by the Engineer.

Mp.4.06 SECURITY

1. Measurement for on-site security will be made in days for the actual number of days that security is provided during working hours at active access gates to the Plant Site without regard to the number of individual security personnel employed.
2. Payment for site security will be made on a daily basis bid in the Form of Bid for Item C-6 which price and payment shall be full compensation for furnishing and maintaining security at the two access gates to the Plant Site at such times the gates are in service during working hours; maintaining sign-in, sign-out log for visitors and site personnel; posting and maintaining all required signs; limiting vehicular traffic on-site to authorized vehicles only; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.5 INTERNAL GROUNDWATER COLLECTION SYSTEM

Mp.5.01 PIPE INSTALLATION

1. Measurement for construction of the internal groundwater collection system will be made in lineal feet at the actual number of lineal feet of pipe installed as directed and measured by the Engineer.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Items D-1 through D-25 which price and payment will be full compensation for supply of equipment, labor and materials required to excavate the subdrain trench to the grades shown on the Contract Drawings; lay the 4 inch and 6 inch diameter perforated clay pipe; backfill trench with granular filter material; disposal of all material excavated from the trench excavation; perform quality control testing during pipe installation; and all other miscellaneous items for which separate payment is not provided under other Items.
3. Payment for covering disposed trench spoils with clay fill will be made under Item G-2.

Mp.5.02 MANHOLE AND MANHOLE SUMPS

1. Measurement for construction of 48"Ø manholes and 96"Ø manhole sumps will be made in vertical feet at the actual number of vertical feet of manholes and manhole sumps installed along the collection system as directed and measured by the Engineer.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item D-26 and D-27 which price and payment will be full compensation for supply of equipment labor and materials required to excavate, place and compact granular material for the base bedding; set manhole base level; connection of collection system into manholes and manhole sumps; backfill with approved granular material; disposal of excavated spoils on the Plant Site; supply and installation of cast iron frames and lids; benching inverts and supply of prebenched manhole bases; final cleaning and inspection; and all other items and services for which payment is not provided under other items of the Form of Bid.
3. Payment for covering disposed trench spoils with clay fill will be made under Item G-2.

Mp.5.03 GRANULAR SUMPS

1. Measurement for the granular sumps will be made at the actual number of each granular sump constructed as determined by the Engineer.

2. Payment for the quantities determined above will be made at the unit price bid in the Form of Bid for Item D-28 which price and payment shall be full compensation for excavating the sumps at the upgradient end of all drain lines; disposal of all excavated spoils on the Plant Site; backfilling with an approved granular filter material; and all other items for which payment is not provided under other Items of the Form of Bid.
3. Payment for covering disposed spoils with clay fill will be made under Items G-2.

Mp.5.04 DEWATERING

1. Payment for dewatering of the collection system excavation will be made at the lump sum bid price in the Form of Bid for Item D-29, which price and payment shall be full compensation for labor, materials and equipment required to provide a suitable means of maintaining a dry work area during the installation of the collection system; maintaining the base of the excavation to prevent a quick condition; disposal of collected water in the on-site holding tank; and all other items and services for which payment is not provided under other items of the Form of Bid.

Mp.6 FINAL COVER

Mp.6.01 GAS VENTS

1. Measurement for gas vents will be made at the actual number of each prefabricated gas vent installed as located on the Contract Drawings.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item E-1 which price and payment shall be full compensation for supplying all labor, materials and equipment required to install the prefabricated gas vents as detailed on the Contract Drawings.
3. Supply of the prefabricated gas vent unit F.O.B. St. Louis, Michigan will be the responsibility of the Owner.

Mp.6.02 CLAY CAP PREPARATION

1. Payment for proof rolling the entire Plant Site prior to construction of the clay cap will be made at the lump sum price bid in the Form of Bid for Item E-2, which price and payment will be full compensation for supplying all labor, materials and equipment required to, compact the pre-existing Plant Site soils to 90% Standard Proctor Density prior to constructing the final clay cap; fill and compact any voids or areas of substantial settlement with imported fill; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.6.03 CLAY CAP

1. Measurement for clay cap construction will be made in cubic yards calculated by the average end area method from cross-sections of the borrow pit taken prior to and subsequent to excavation of clay material.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item E-3 which price and payment will be full compensation for supply of equipment, labor and materials required to excavate, transport and place clay material from the project borrow pit; compact clay in six inch lifts to a minimum density of 98% Modified Proctor; management of the clay borrow pit including dewatering, construction and maintenance of haul roads and provision of any required utilities; clean up of spillage along haul roads due to Contractor's operations; reexcavation of clay cap to verify the depth of clay on the Plant Site; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.6.04 SAND BLANKET

1. Measurement for the sand blanket will be made in cubic yards verified by receipts provided from the source of the sand.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item E-4 which price and payment shall be full compensation for furnishing and placing the dividing sand lense prior to topsoil placement as directed by the Engineer.

Mp.6.05 TOPSOIL

1. Measurement for spreading six inches of topsoil over the entire Plant Site will be made in cubic yards based on field measurements of topsoiled areas.
2. Payment for the quantity determined above will be made at the unit price bid in the Form of Bid for Item E-5 which price and payment will be full compensation for hauling, spreading and raking the topsoil; for cleaning up any spillage along haul roads as a result of the Contractor's operations; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.6.06 SEED AND MULCH

1. Measurement for seed and mulch will be made in acres at the actual number of acres seed and mulched as determined in the field.
2. Payment for the quantity determined above will be made at the unit price per acre bid in the Form of Bid for Item E-6 which price and payment shall be full compensation for furnishing and seeding and mulching the entire Plant Site subsequent to final raking of the topsoil.

Mp.6.07 SOD DITCHES

1. Measurement for sod along all Plant Site swales will be made in square yards at the actual number of square yards laid as directed and measured by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per square yards bid in the Form of Bid for Item E-7, which price and payment shall be full compensation for furnishing and laying all sod along pregraded drainage swales; for supplying sufficient water to ensure root development of the sod; for maintenance of sod until preliminary acceptance of the project or as a minimum two cuttings; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.6.08 GRANULAR SERVICE ROADS

1. Measurement for granular material will be made in tons measured by a State certified scale of the actual quantity, authorized by the Engineer, and delivered to the site for incorporation in the work as documented by a source weight ticket.
2. Payment for the quantity determined above will be made at the unit price per ton bid in the Form of Bid for Item E-8 which price and payment shall be full compensation for furnishing, hauling, placing and compacting the material; for grading and maintenance of granular site roadways for the Project duration; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.6.09 WATER

1. Measurement for supply of water will be made in thousand gallons (m Gal.) determined by the measured capacity of the water truck used to transport the water to the Plant Site.
2. Payment for the quantity determined above will be made at the unit price per thousand gallons bid in the Form of Bid for Item E-9 which price and payment shall be full compensation for furnishing, hauling and spreading the water during compaction of the clay cap and sub-base as ordered by the Engineer.

Mp.7 RIVERBANK ARMORING

Mp.7.01 FILTER FABRIC

1. Measurement for filter fabric will be made in square yards at the actual number of horizontal square yards in place as determined and authorized by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per square yard bid in the Form of Bid for Item F-1 which price and payment thereof shall be full compensation for furnishing and placing the filter fabric and other miscellaneous items for which separate payment is not provided under other Items.

Mp.7.02 RIP RAP

1. Measurement for rip rap will be made in square yards at the actual number of square yards of rip rap placed along the riverbank as determined by field measurements.
2. Payment for the quantity determined above will be made at the unit price per square yard bid in the Form of Bid for Item F-2 which price and payment shall be full compensation for furnishing, hauling and machine placing rip rap to a depth of 12 inches as directed by the Engineer.

Mp.7.03 GROUT CAP

1. Measurement for tying in the upper edge of filter fabric to rip rap will be made in lineal feet constructed as detailed on the Contract Drawings.
2. Payment for the quantity determined above will be made at the unit price per lineal feet bid in the Form of Bid for Item F-3, which price and payment shall be full compensation for grouting the upper edge of the filter fabric to the rip rap along the entire length of river armoring as detailed on the Contract Drawings.

Mp.8 ON-SITE MAINTENANCE

Mp.8.01 DISPOSAL OF DEBRIS

1. Payment for disposal of concrete and steel debris will be made at the lump sum bid price in the Form of Bid for Item G-1, which price and payment shall be full compensation for excavation and removal of all debris from excavations; for cutting or breaking debris into manageable sizes; for transporting debris to the Plant Site disposal area; and all miscellaneous items for which separate payment is not provided under other Items.

Mp.8.02 COVER DISPOSED SPOILS

1. Measurement for importing cover material will be made in bank cubic yards determined from cross-sections of the clay borrow pit prior to and subsequent to clay excavation and delivered to the Plant Site to cover all disposed spoils. Volumes will be computed by the average end area method.
2. Payment for the quantity determined above will be made at the unit price per bank cubic yard bid in the Form of Bid for Item G-2 which price and payment shall be full compensation for supply of all materials, equipment and labor required to excavate, load and transport clay material to the Plant Site; cover disposed spoils with a minimum of 12 inches of material; compact clay cover in 6 inch lifts to 90% Standard Proctor Density; maintenance of clay pit and provision of any utilities required at the clay pit; and all other miscellaneous items for which payment is not provided under other Items of the Form of Bid.

Mp.8.03 ROAD SWEEPER

1. Measurement for a mechanical road sweeper will be made in hours at the actual number of hours spent sweeping City owned roadways adjacent to work activities to prevent the generation of dust.
2. Payment for the quantity determined above will be made at the unit price per hour bid in the Form of Bid for Item G-3 which price and payment shall be full compensation for furnishing a mechanical road sweeper as required to clean city roadways; and dispose of sweepings on the Plant Site as designated by the Engineer.

Mp.8.04 CALCIUM CHLORIDE

1. Measurement for placing calcium chloride will be made in gallons at the actual number of gallons used as directed by the Engineer.

2. Payment for the quantity determined above will be made at the unit price per gallon bid in the Form of Bid for Item G-4 which price and payment shall be full compensation to furnish and apply calcium chloride to granular traffic areas to reduce generation of airborne particulates.

Mp.8.05 SUPPLY AND INSTALL 8' HIGH CHAIN LINK SECURITY FENCE

1. Measurement for supply and installation of 8' High Chain Link Security Fence will be by the lineal foot of fence actually erected and measured by the Engineer around the perimeter of the Plant Site excluding the Pine River embankment, and will include the installation of one 20 foot wide lockable access gate at the North end of Bankson Street and one 4 foot wide lockable access gate at a location specified by the Engineer.
2. Payment for the quantity determined above will be made at the unit price per lineal foot bid in the Form of Bid for Item G-5 which price and payment shall be full compensation to supply and erect the security fencing and supply and erect all gates, brace panels, top rails; install all perimeter warning signs as supplied by Owner; and all other miscellaneous items for which payment is not provided in the Form of Bid.
3. Payment under this item shall also include the supply of 2 brass padlocks, keyed alike. All keys to be surrendered to the Engineer at the conclusion of the Project.

Mp.8.06 CONSTRUCT AND MAINTAIN SEDIMENTATION CONTROL STRUCTURES

1. Payment for the construction and maintenance of sedimentation control structures will be made at the lump sum price bid in the Form of Bid for Item G-6, which price and payment shall be full compensation for the supply of labor, materials and equipment required to construct and maintain straw sedimentation control weirs at each offtake ditch outlet; maintenance of the controls until a strong vegetative cover is established on the entire Plant Site; removal of all straw at the completion of the project; spread straw and hay over Plant Site with an approved mulch blower; removal of any stone or gravel utilized in the sedimentation controls and dispose along the Plant Site service roads; and all miscellaneous items for which separate payment is not provided under other Items.

Mp.8.07 50' EASEMENT

1. Measurements for excavation of soils within the 50' temporary construction easement will be made in bank cubic yards determined from calculations made using average end area method from cross-sections of the excavated areas taken prior to and subsequent to excavation of the material.

2. Payment for the quantity determined above will be made at the unit price per bank cubic yards bid in the Form of Bid for Item G-7 which price and payment shall be full compensation for supply of all materials, equipment and labor to excavate load and transport the top one foot of surficial material within the 50' temporary easement; removal of all vegetation from the excavation area; disposal of all spoils on the Plant Site in an area designated by the Engineer; and all other miscellaneous items for which separate payment is not provided under other Items.
3. Payment for covering of the excavated material will be made under Item G-3.

Mp.8.08 IMPORTED BACKFILL

1. Measurement for imported backfill will be made in bank cubic yards determined from cross-sections of the clay borrow pit prior to and subsequent to fill and topsoil excavation and delivered to the Plant Site for use as backfill for the excavation described in Mp.8.08. The excavation must have a final cover of six inches of topsoil.
2. Payment for the quantity determined above will be made at the unit price per bank cubic yard bid in the Form of Bid for Item G-8 which price and payment shall be full compensation for supply of all materials, equipment and labor required to excavate load and transport fill material and topsoil from the borrow pit to the Plant Site; clean up any spillage of material along haul routes as a result of operations; and all other miscellaneous items for which payment is not provided under other Items.

Mp.8.09 MAINTAIN, CLEAN, AND RESTORE CITY AND COUNTY OWNED HAUL ROUTES

1. Payment for maintaining, cleaning and restoring haul roads owned by the City of St. Louis or Gratiot County will be made at the lump sum price bid in the Form of Bid under Item G-9 which price and payment shall be full compensation for all regrading, resurfacing, shouldering, cleaning, and other items required to maintain haul roads to the satisfaction of the Engineer and municipal and City officials, including final restoration to a condition no worse than pre-existing.

Mp.9 PROJECT CLOSURE

Mp.9.01 DECONTAMINATE EQUIPMENT

1. Payment for equipment decontamination will be made at the lump sum price bid stipulated in the Form of Bid for Item H-1 which price and payment shall be full compensation for decontamination of all equipment contacting site soils or groundwater prior to removal from site; collection of wash waters from the decontamination facility and transport to the on-site holding tank; supply of a high pressure hot water wash unit; collection of all sediments and residues from the decontamination facility and disposal of collected material on-site as directed by the Engineer; and all other miscellaneous items for which separate payment is not provided under other Items.

Mp.9.02 CLEANUP AND DEMOBILIZATION

1. Payment for final site cleanup and demobilization will be made at the lump sum price bid in the Form of Bid for Item H-2 which price and payment shall be full compensation for removal and disposal of all debris on-site; removal of all equipment and materials from site; and regrading of all access or haul roads to prevent ponding all to the satisfaction of the Engineer.

APPENDIX A

VELSICOL CHEMICAL CORPORATION

GUIDELINES FOR AN ACCEPTABLE RESPIRATOR PROGRAM

VELSICOL CHEMICAL CORPORATION
ENVIRONMENTAL HEALTH AND HYGIENE DEPARTMENT
GUIDELINES FOR AN ACCEPTABLE RESPIRATOR PROGRAM

INTRODUCTORY STATEMENT REGARDING THE USE OF RESPIRATORS

Every consideration shall be given to the use of effective engineering controls to eliminate or reduce exposure to respiratory hazards to the point that respirators are not required. OSHA regulations specify that compliance with the permissible exposure limits of potentially hazardous substances may not be accomplished through the use of respirators except: 1) during the period necessary to install engineering controls; 2) in situations in which engineering controls are either not feasible or to an extent insufficient to reduce the airborne concentration of the potentially hazardous substance below the specified permissible exposure limit; and, 3) in emergency situations. In summary, approved respirators must be made available and used only when it is not possible or practical to affect or maintain engineering controls. If the use of a respirator is deemed necessary, it is essential that all OSHA regulations are complied with.

RESPIRATOR PROGRAM GUIDELINES

The following corporate guidelines satisfy, in part, the OSHA requirement for written operating procedures. For complete OSHA compliance, each facility must also document specific activities and procedures involving the use of respirators.

I. WRITTEN STANDARD OPERATING PROCEDURES GOVERNING THE SELECTION AND USE OF RESPIRATORS SHALL BE ESTABLISHED

Overall responsibility for documenting and administering the respirator program resides with the manager of the facility. This responsibility can be delegated to another person; the facility safety incumbent is recommended. The person selected to head the respirator program shall possess/obtain adequate knowledge in all aspects of respiratory protection. This administrator should coordinate respirator purchasing, maintenance, cleaning, and training. Development and implementation of facility respirator operating procedures are included in the duties of this person.

II. RESPIRATORS SHALL BE SELECTED ON THE BASIS OF THE HAZARDS TO WHICH THE WORKER IS EXPOSED

There are various types of respirators available with certain capabilities and limitations. These different types range from disposable dust masks to self-contained breathing units. Proper selection is based on the physical, chemical, and physiological properties of the air contaminant (Addendum A) and on the concentration likely to be encountered. The quality of fit and the nature of work being performed also affect the choice of

respirators since some manufacturers offer the same model in two or three sizes. This will help to fit most employees properly with one brand of respirator.

The Environmental Health and Hygiene Department will assist in the selection of respirators by providing relevant information on contaminant properties and evaluating existing hygiene information.

III. THE USER SHALL BE INSTRUCTED AND TRAINED IN THE PROPER USE OF RESPIRATORS AND THEIR LIMITATIONS

Respirators shall not be issued to individuals (including contractors/visitors) who have not received respirator training.

The extent and frequency of worker training depends primarily on the nature and extent of the hazard. As a minimum, both workers and supervisors shall be trained in basic respirator practices. Respirators are effective only when they are acceptable to the worker and worn by him/her. Because proper use depends especially upon the wearer's motivation, it is important that the need for the respirator be explained fully. The basic training program should include:

- a) Discussion of the nature of airborne contaminants against which the wearer should be protected.
- b) Explanation of why other means of control are not immediately feasible.
- c) A discussion of why the respirator is the proper one for the particular purpose. Canisters, chemical cartridges, and filters do not have the same capabilities. For example, gas and vapor removing respirators provide no protection against particulate contaminants unless specified on the canister or chemical cartridge label. Likewise, particulate removing respirators protect against non-volatile particles only and do not provide protection against gases and vapors. A self-contained breathing apparatus (SCBA) is the appropriate respirator for any emergency and/or oxygen deficient situation.
- d) Instruction on the respirator's limitations. It should be emphasized that because of the limited useful service life of vapor canisters and cartridges, they shall be replaced daily or after each use, or even more often if the wearer detects odor, taste, or irritation. Particulate filters may be used until breathing resistance increases to an "uncomfortable" level.
- e) Instruction in procedures for assuring the respirator is in proper working condition.
- f) Instruction in fitting (Addendum B) and training in actual use, including a test of the facepiece-to-face seal. Respirators shall not be worn when conditions prevent a satisfactory face

seal. The conditions which may possibly prevent a satisfactory seal are long sideburns, a beard, temples on eyeglasses, absence of dentures, or an unusually structured face. If the conditions cannot be corrected or eliminated, the worker shall not be assigned to any area requiring routine or emergency use of respirators.

- g) Instruction in the proper maintenance of the respirator.
- h) Field training to recognize and cope with emergency hazards. Training shall include actual donning of the respirator for emergency use.

IV. WHERE PRACTICABLE, THE RESPIRATORS SHALL BE ASSIGNED TO INDIVIDUAL WORKERS FOR THEIR EXCLUSIVE USE

Each respirator permanently assigned to an individual should be durably marked to indicate to whom it was assigned. This mark shall not affect the respirator performance in any way.

V. RESPIRATORS SHALL BE REGULARLY CLEANED AND DISINFECTED. THOSE ISSUED FOR THE EXCLUSIVE USE OF ONE WORKER SHOULD BE CLEANED AFTER EACH DAY'S USE, OR MORE OFTEN IF NECESSARY. THOSE USED BY MORE THAN ONE WORKER SHALL BE THOROUGHLY CLEANED AND DISINFECTED AFTER EACH USE.

Each respirator shall be washed with a detergent in warm water, rinsed, and dried. For complete decontamination against phosphate pesticides, the respirator shall be washed with alkaline soap and rinsed with 50 percent alcohol (ethyl or isopropyl). When a respirator is used by more than one individual, the respirator must also be disinfected after each use. Cleaner/disinfectant solutions, that effectively clean respirators and contain a bactericidal agent, are available commercially from respirator manufacturers.

The following procedures are recommended for cleaning and disinfecting respirators:

- a) Remove and discard any filters, cartridges, or canisters.
- b) Wash facepiece and breathing tube in detergent and warm water (120°F) or cleaner/disinfectant solution. Use a soft brush to facilitate removal of dirt.
- c) Rinse completely in clean, warm water.
- d) Air dry in clean area.
- e) Clean out other parts as recommended by manufacturer.
- f) Inspect valves, headstraps, and other parts and replace with new parts if defective.
- g) Place facepiece in plastic bag or container for storage in

assigned respirator storage area.

- h) Insert new filters, cartridges, or canisters prior to use; make sure seal is tight.

VI. RESPIRATORS SHALL BE STORED IN A CONVENIENT, CLEAN, AND SANITARY LOCATION

Respirators placed at work stations and work areas for emergency use shall be stored in compartments built for this purpose, be quickly accessible at all times and be clearly marked. Manufacturer's instructions shall be closely followed for proper storage of gas masks and self-contained breathing apparatus. When not in use, routinely used respirators, such as dust respirators, shall be placed in plastic bags and stored in cabinets at convenient locations in the work area in order to protect against dust, sunlight, extreme temperatures, excessive moisture, or damaging chemicals.

VII. RESPIRATORS SHALL BE INSPECTED DURING CLEANING BY TRAINED PERSONNEL. RESPIRATORS FOR EMERGENCY USE, SUCH AS SELF-CONTAINED DEVICES, SHALL BE THOROUGHLY INSPECTED AT LEAST ONCE A MONTH AND AFTER EACH USE.

Personnel involved in respirator maintenance must be thoroughly trained. Substitution of parts from a different brand or type of respirator invalidates approval of the device. Therefore, they must be aware of the limitations and never try to replace components or make repairs and adjustments beyond the manufacturer's recommendations, unless they have been specially trained by the manufacturer.

All equipment shall be inspected before and after use. Emergency equipment shall be inspected at least monthly to assure that it is in satisfactory working condition. A record shall be kept of inspection dates for respirators for emergency use and findings tabulated. The general inspection check list should include:

- a) Tightness of connections.
- b) Condition of facepiece, straps, connecting tubes, and canisters.
- c) Condition of exhalation and inhalation valves. If the sides of the exhalation valve gap even slightly, a new valve shall replace old.
- d) Pliability and flexibility of rubber parts. Deteriorated rubber parts shall be replaced. Unused rubber parts should be worked, stretched, and manipulated with a massaging action during inspection.
- e) Condition of lenses of full facepiece respirator. Damaged lenses shall be replaced or respirator sent to the manufacturer.
- f) Check on the charge of compressed air cylinder of self-contained breathing apparatus. The cylinders shall be fully charged accord-

ing to the manufacturer's instructions.

g) Proper functioning of regulators and warning devices.

VIII. APPROPRIATE SURVEILLANCE OF WORK AREA CONDITIONS AND DEGREE OF EMPLOYEE EXPOSURE SHALL BE MAINTAINED

The Environmental Health and Hygiene Department will provide assistance in maintaining the necessary facility surveillance program. The facility manager is responsible for notifying the Environmental Health and Hygiene Department of any operational (including materials) changes which may affect potential employee exposure. This applies whether or not the original operation had required respirator use.

IX. THERE SHALL BE REGULAR INSPECTION AND EVALUATION TO DETERMINE THE CONTINUED EFFECTIVENESS OF THE PROGRAM

Each Velsicol facility will be required to submit a respirator usage chart annually in June (Addendum D). Any newly written respirator guidelines for a specific facility shall be included.

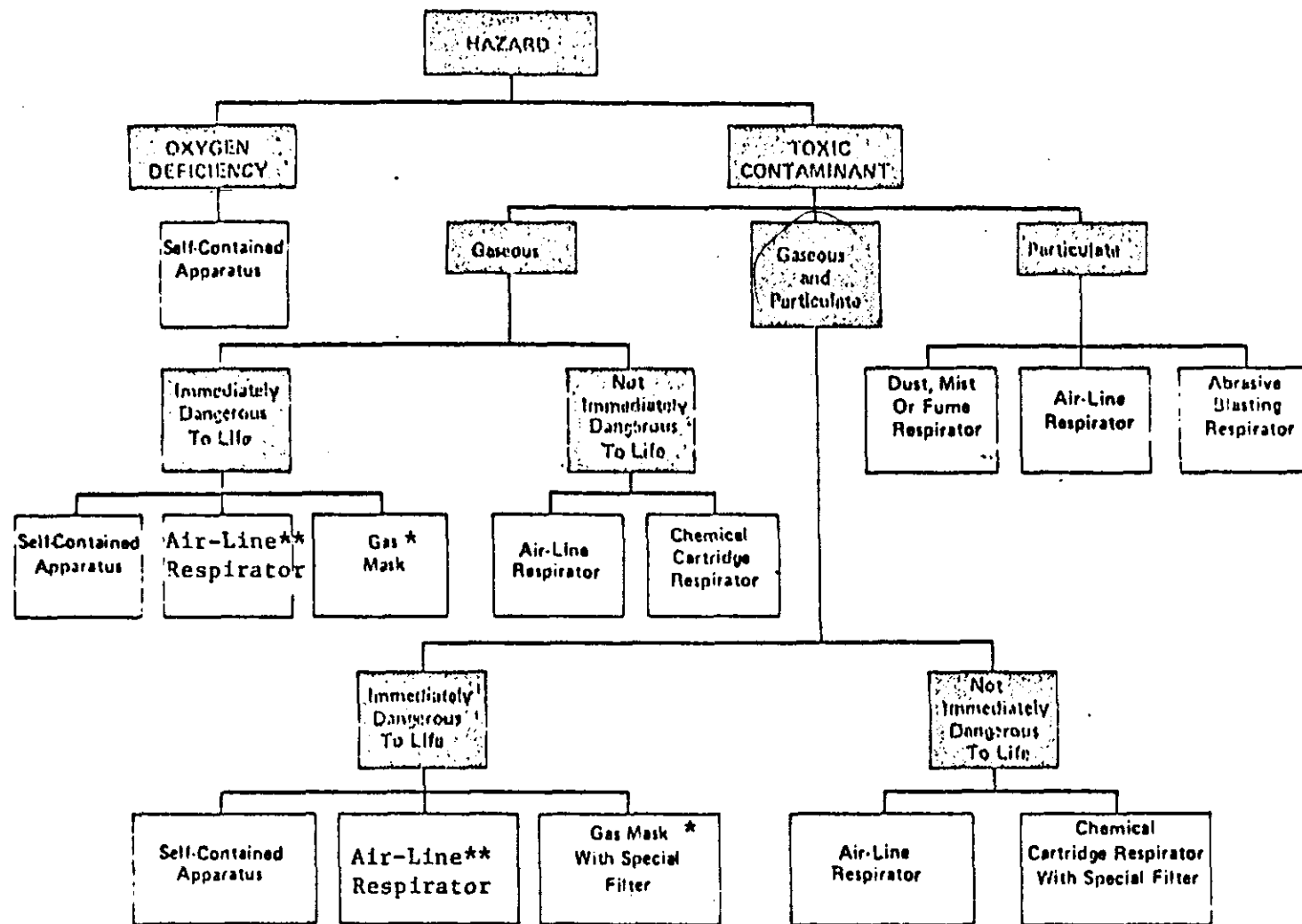
X. PERSONS SHALL NOT BE ASSIGNED TO TASKS REQUIRING USE OF RESPIRATORS UNLESS IT HAS BEEN DETERMINED THAT THEY ARE PHYSICALLY ABLE TO PERFORM THE WORK AND USE THE EQUIPMENT. THE LOCAL PHYSICIAN SHALL DETERMINE WHAT HEALTH AND PHYSICAL CONDITIONS ARE PERTINENT. THE RESPIRATOR USER'S MEDICAL STATUS SHALL BE REVIEWED PERIODICALLY.

XI. APPROVED OR ACCEPTED RESPIRATORS SHALL BE USED WHEN THEY ARE AVAILABLE. THE RESPIRATOR FURNISHED SHALL PROVIDE ADEQUATE RESPIRATORY PROTECTION AGAINST THE PARTICULAR HAZARD FOR WHICH IT WAS DESIGNED IN ACCORDANCE WITH STANDARDS ESTABLISHED BY COMPETENT AUTHORITIES.

At the present time, the National Institute for Occupational Safety and Health (NIOSH) has the sole responsibility for the approval of respirators used in any workplace other than mines. The Mine Safety and Health Administration (MSHA) approves those classes of respirators intended for use in mines.

Requirements for supplied breathing air quality are outlined in Addendum E. Air-line and self-contained breathing apparatus are the respirator types associated with compressed breathing air systems.

Addendum A
GUIDE TO SELECTION AND USE



* For emergency escape only

** With emergency escape bottle

Addendum B

RESPIRATOR FIT

An employee wearing a respirator can be protected against airborne contaminants only if there is successful sealing of the respirator on his or her face. All employees may not obtain a successful fit for a specific respirator, since facial dimensions vary considerably from person to person. A half facepiece must contact a rather complex facial surface and the possibility of leakage is greater than in the case of the full facepiece. Studies have shown that temples on glasses, absence of dentures, full beards, handlebar moustaches or wide sideburns can reduce respirator performance by as much as 25%.

The respirator facepiece-to-face seal shall be tested each time the employee enters a contaminated atmosphere. Most respirator manufacturers provide instructions for wearing and leak testing and these instructions shall be followed. Training programs shall annually cover these procedures. Facepiece-to-face fit tests include the following:

- A. Positive Pressure Test - Close or "block off" the exhalation valve and exhale gently into the facepiece. If a slight positive pressure is built up with no apparent outward leakage around the seal, then the facepiece-to-face seal is satisfactory. Note that this test only applies to those respirators which have an exhalation valve which can be blocked (the exhalation valve cover may have to be removed for the test).
- B. Negative Pressure Test - Close the inlet opening or hose of the respirator facepiece with the hand(s), tape or other means, inhale gently so that the facepiece collapses slightly and hold the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage occurs, then the facepiece-to-face seal is probably satisfactory.
- C. Isoamyl Acetate Test for Organic Vapor Cartridge Respirator, Canister Gas Mask or Air-Supplied Respirator - Wave a cotton swab soaked in isoamyl acetate⁽¹⁾ around the facepiece of the respirator. If the employee wearing the respirator detects the odor of isoamyl acetate, then the facepiece leaks. During the test, the employee should move and talk as he or she would during work.
- D. Visual Examination Test for Dust Respirator - Remove respirator and immediately examine the employee's face for traces of dust inside the seal area resulting from inward leakage from the environment. Note that this "after the fact" fit test is applicable to disposable dust respirators with or without exhalation valves.

(1) Isoamyl acetate can be obtained from a laboratory chemical supply firm.

If leakage is detected, the facepiece should be readjusted and the test repeated. If leakage is still noted, it can be concluded that this particular respirator will not provide an adequate seal for this employee. The employee should not continue to tighten the headband straps until they are uncomfortably tight simply to achieve an adequate facepiece-to-face seal. Different brands of respirators can be tested for "hard-to-fit" employees. A full facepiece respirator can be substituted for a half facepiece respirator. The only other alternative is to wear a respirator that provides positive pressure to the facepiece. Such respirators are powered air purifying respirators and air supplied respirators (continuous flow or pressure-demand). The powered air purifying respirator is battery operated and shall not be used in explosive atmospheres.

Employee surveillance shall be maintained by supervisory personnel to identify those facial conditions (hair, glasses, loss of dentures, etc.) which interfere with facepiece-to-face seal.

If the respirator does not fit properly and the condition cannot be corrected or eliminated, then the individual shall not be permitted to work in an area requiring routine or emergency use of respirators.

2. Wash facepiece and breathing tube in detergent and warm water (120°F) or cleaner/disinfectant solution. Use a soft brush to facilitate removal of dirt. (For phosphate pesticide respirators, wash with an alkaline soap and rinse with a 50% alcohol (ethyl or isopropyl) solution).
3. Rinse completely in clean, warm water.
4. Air dry in clean area.
5. Clean out other parts as recommended by manufacturer.
6. Inspect valves, headstraps, and other parts and replace with new parts if defective.
7. Place in plastic bag or container for storage.
8. Insert new appropriate filters, cartridges, or canisters prior to use; make sure seal is tight.

(Addendum D)

RESPIRATOR USAGE CHART

<u>Facility</u>	<u>Date</u>					<u>Individual Completing Chart</u>
<u>Description of Specific Operation(s) where Respirators are Used/Employee Job Title</u>	<u>Frequency & Duration of Use</u>	<u>Contaminant(s)</u>	<u>RESPIRATOR</u>			<u>Number of Respirators Issued</u>
			<u>Type</u>	<u>Brand/Model No.</u>	<u>NIOSH/MSHA Approval No.</u>	
Connecting chlorine tank car/No. 1 Product operator	5 times/week 30 minutes/time	Chlorine	Full facepiece chemical cartridge	Acme/3101	TC-23C-77	3

The above is an example description of a respirator usage situation.

Addendum E

SUPPLIED BREATHING AIR QUALITY FOR RESPIRATORS

Breathing air shall be of high purity such that toxic compounds (particulate, vapor, or gas) are not present in sufficient concentration to threaten the health and safety of the user.

OSHA regulations, as a minimum, require that breathing air meet Grade D specifications as described and determined by analytical methods (or equivalent) in Compressed Gas Association (CGA) Commodity Specifications G-7.1-1973. Each facility utilizing compressed breathing air must have the equipment to determine carbon monoxide and oxygen content. A list of direct reading instruments for determination of oxygen and carbon monoxide concentrations is given in Appendix i, and applicable sampling procedures are given in Appendix ii. Manufacturers' instructions shall be followed for the calibration, use, and maintenance of these instruments. The specifications for Grade D breathing air are:

	<u>Grade D</u>
Carbon Monoxide	< 20 ppm
Carbon Dioxide	< 1000 ppm
Oxygen	19-23%
Oil Mist	< 5 mg/M ³
Odor	Free from pronounced odor

Although Grade D specifications allow measurable concentrations of carbon monoxide, any carbon monoxide above normal atmospheric levels indicates a "problem" with the compressed air supply equipment or procedures and should be investigated.

Breathing air may be supplied from cylinders, blowers, or compressors.

I. Breathing Air Cylinders

- A. Request suppliers to certify in writing that air purity meets CGA Commodity Specifications G-7.1-1973 for Grade D breathing air. Compressed breathing air cylinders shall be clearly labeled as such.

< - Less than
ppm - Parts of contaminant per million parts of air by volume
mg/M³ - Milligrams of contaminant per cubic meter of air

- B. Determine whether supplier compresses ambient air or manufactures synthetic air from nitrogen and oxygen. Check every compressed ambient air cylinder for carbon monoxide, and every synthetic air cylinder for oxygen since local suppliers may or may not comply with cylinder preparation or quality verification requirements of CGA Commodity Specification G-7.1-1973.
- C. Return to the supplier compressed breathing air found to have oxygen deficiency, carbon monoxide contamination, pronounced odor or distinct taste.

II. Breathing Air Blower Systems

Locate the hand-operated blower intake in an area free from air contaminants and upwind of potential sources of contamination.

III. Breathing Air Compressor Systems

A. Location

The compressor intake shall be located in a clearly identified area free from air contaminants. The facility supervisor shall be notified of non-routine activities (maintenance, contractors, etc.) which may affect the air quality of the breathing air compressor system.

The compressor shall not be operated near painting, large electric arcs, by-product gases from production processes, etc.

B. General Requirements

1. Install temperature rise alarm to indicate compressor malfunction resulting in overheating. Locate the sensor for the high temperature alarm at the outlet of the compressor before the storage chamber and set to activate at temperature specified by manufacturer. This is a precaution against exposure to toxic thermal decomposition products of the oil, lubricant, or lubricating device.
2. Use suitable in-line purifying sorbent beds and filters to assure breathing air quality. The purifier unit must be capable of removing all hazardous contaminants (particles, carbon monoxide, oil mist, etc.).
3. Inspect and maintain breathing air compressor systems. Check condition of friction rings, lubricant consumption, cooling jackets, purifier units, and other components in accordance with the manufacturer's instructions.

C. Type of Compressor

1. Use breathing air type (water or Teflon-lubricated)

compressor.

2. Do the following if an oil or synthetic-lubricated compressor must be used since thermal decomposition can produce carbon monoxide in the breathing air supply:
 - a. Use compressed air purifier designed to remove lubricant mist and carbon monoxide.
 - b. Test the compressed air for carbon monoxide at intervals of no less often than every 80 hours of operation. While continuous carbon monoxide alarms are available, their use is not recommended because of excessive calibration and maintenance requirements.

D. Source of Power

1. Use electric motors in preference to gasoline or diesel engines, since this source does not generate air contaminants.
2. Use diesel in preference to gasoline engines, since gasoline engines are more likely to produce significant quantities of carbon monoxide.
3. Equip engine with extensions for exhaust stack, crank-case vents and compressor intake and check carefully for exhaust manifold leakage.

IV. Multiple Purpose Plant Compressed Air Systems

The use of such systems for breathing purposes is not recommended because of difficulty in insuring against carbon monoxide production and inadvertent back pressuring of hazardous particles, liquids, gases, and vapors into the system. If multiple purpose plant compressed air must be used, follow all of the above guidelines for breathing air compressor systems.

In addition, check for oxygen, carbon monoxide, and hazardous particles, gases, and vapors before using the air-supplied respirators or for ventilating tanks prior to personnel entry.

Appendix 1

List of Direct Reading Instruments

Determination of Percent Oxygen

GasTech Model XP-204
Oxygen Deficiency Indicator

Gas Tech, Inc.
Johnson Industrial Division
331 Fairchild Drive
Mountain View, CA. 94043

BioMarine Industries
Model OA222R
Oxygen Deficiency Detector

BioMarine Industries, Inc.
45 Grand Valley
Corporate Center
Malvern, PA. 19355

MSA Oxygen Indicator
Model 224

Mine Safety Appliances Co.
600 Penn Center Blvd.
Pittsburgh, PA. 15635

Teledyne Model 332B
Personal Safety Oxygen Monitor

Teledyne Analytical Instruments
333 West Mission Drive
San Gabriel, CA. 91776

Determination of Carbon Monoxide Concentrations

Drager Bellows Pump Model 31 with
Drager Model CH 25601 (5/c) CO Tube

Drager, Inc.
401 Parkway View Drive
Pittsburgh, PA. 15205

Drager Bellows Pump Model 31 with
Drager Model CH 20601 (10/b) CO Tube

Same as Above

MSA Samplair Pump, Model A, #464080
with MSA #91229 CO Tube

Mine Safety Appliances Co.
600 Penn Center Blvd.
Pittsburgh, PA. 15635

Bendix/Gastec Model 400 Multi-Stroke
Sampling Pump (Bendix PN 2417534) with
Bendix/Gastec Model 1La CO Tube

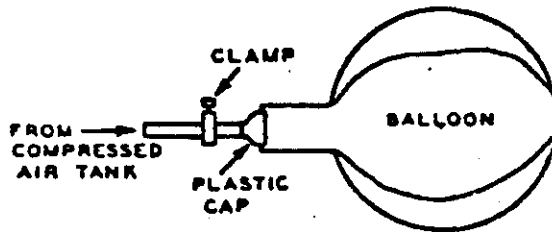
Bendix Corporation
Environmental and Process
Instruments Division
Lewisburg Plant, Drawer 831
Lewisburg, WV 24901

Matheson/Kitagawa Model 8014-400
Aspirating Pump with Kitagawa
Model 106S CO Tube

Matheson Gas Products
P. O. Box E
Lyndhurst, NJ. 07071

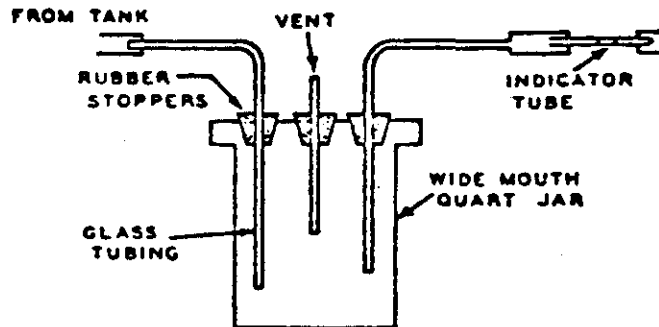
Appendix 11
Sampling Procedures

Non-Rigid Container



Partially blow up balloon, plastic bag or bladder with compressed air. Let air out of this container until wrinkles appear. Set clamp and place sensor of direct reading instrument into free end. Open clamp and operate instrument.

Rigid Chamber



Discharge compressed air slowly through chamber. Place sensor of direct reading instrument into free end and operate.

APPENDIX B

BOREHOLE LOGS

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

DATE E-4-82

BORING NO. DEW1

PROJECT S.E.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	6	FT.	0
G.W. ENCOUNTERED AT		FT.	0
G.W. AFTER COMPLETION	10	FT.	0
G.W. AFTER		HRS.	0
G.W. VOLUMES	<u>HEAVY</u>		

Start taking routine penetration test one foot above nominal depth of drill 3"

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 5" Penetration
	0				
1 SS	1			MIX SAND & CLINKERS W/ L. MOIST EX. COMPACT	5 13 16
	2				10
2 SS	3				5 11 6
	4				8
3 SS	5				7 11 16
	6				12
4 SS	7		1'-0"	MIX SAND FILL W/ T. VERY COMPACT	3 5 8
	8				11 7
5 SS	9		8'-0"	MED. SAND BROWN W/ T. EX. COMPACT	11
	10		9'-3"	SANDY CLAY BROWN MOIST EX. STIFF	18
			9'-9"	SANDY CLAY GREY MOIST EX. STIFF	18
6 SS	11		10'-3"	MED. SAND BROWN MOIST EX. COMPACT	14
			10'-5"	CLAY GREY W/ P. MOIST EX. STIFF	25 34 35
	12				18
7 SS	13				35
	14				41
	15			▼ 14' END OF HOLE	52
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

S.S.—SPLIT SPOON R.C.—ROCK CORE OTHER—

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 1.5

DATE 8-4-82

PROJECT S.F.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	<u>5</u>	FT.	<u>0</u> INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	<u>5</u>	FT.	<u>0</u> INS.
G.W. AFTER		HRS.	FT. INS.
G.W. VOLUMES	<u>Primary</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 5"	Penetration
	0					
	1			MIX SAND & CINDERS FILL MOIST		
	2					
	3					
	4					
	5					
	6		5'0"	MIX SAND & CINDERS FILL WET		
	7					
	8					
	9		8'0"	SANDY CLAY BROWN MOIST		
	10		9'0"	CLAY GRAY W.P. MOIST		
	11			10' END OF HOLE		
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS

LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 1,75

ELEVATION _____

DATE F-4-52

PROJECT SIF.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER E-OVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	5	FT. 0	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	5	FT. 0	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES <u>HGANV</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6"	Penetration
	0					
	1			MIX SAND & CINDERS FILL MOIST		
	2					
	3					
	4					
	5					
	6		5'0"	MIX SAND & CINDERS FILL WET		
	7		6'6"	CLAY GRAY W.P. MOIST		
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

9'6" END OF HOLE

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

DATE 8-11-82

BORING NO. DEW. 1.F6

PROJECT C.E.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	5	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	5	FT.	0	INS.
G.W. AFTER		HRS.		FT.
G.W. VOLUMES	<u>HIGH</u>			INS.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6"	Penetration
	0					
	1			MIX SAND & GRAVELS FINE MOIST		
	2					
	3					
	4					
	5					
	6			5.0" MIX SAND & GRAVELS FINE MOIST		
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18			17.0" SANDY CLAY GREY W.P. MOIST		
	19					
	20					
	21					
	22					
	23					
	24					
	25					

▲ 19.6" END OF HOLE

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

DATE 8-4-62

BORING NO. DGW2

PROJECT ...E.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER I-OVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	5	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	9	FT.	0	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES	<u>HIGH</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.) Blows / 6"</small>	Penetration
	0				
1 SS	1			MIX SAND & CINDERS FILL MOIST EX. COMPACT	7
	2				11
	3		2'0"	MIX SAND & CINDERS FILL MOIST COMPACT	14
2 SS	4				14
	5				6
3 SS	6		5'0"	MIX SAND & CINDERS FILL WET MED. COMPACT	8
	7				8
4 SS	8				7
	9				4
5 SS	10				4
	11				4
6 SS	12		9'0"	MIX SAND & CINDERS FILL WET VERY COMPACT	3
	13				4
	14				3
7 SS	15				2
	16				3
8 SS	17				6
	18		11'0"	MIX SAND & CINDERS FILL WET SLIGHTLY COMPACT	10
9 SS	19				6
	20				6
10 SS	21				2
	22				1
11 SS	23				1
	24				3
12 SS	25				6
	26		17'0"	COARSE SAND & GRAVEL WET & LAYERS OF RIVER BOTTOM EX. COMPACT	13
13 SS	27				21
	28				4
14 SS	29		19'0"	MED. SAND BROWN MOIST VERY COMPACT	8
	30		19'6"	CLAY GREY W.P. MOIST EX. STIFF	19
15 SS	31				35
	32				45
16 SS	33				98
	34				118
17 SS	35				50
	36				120
	37			22'6" END OF HOLE	
	38				
	39				
	40				
	41				
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	271				

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 3
ELEVATION _____

DATE 8-4-82

PROJECT S.F.

LOCATION ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	5	FT.	-
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	15	FT.	0
G.W. AFTER		HRS.	FT.
G.W. VOLUMES	<u>HEAVY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) .Blows / 6"	Penetration
	0				
1	1			MIX SAND CLAY & CINDEES FULL MOIST EX. COMPACT	8 20 15
	2				14
2	3				8 9
	4				11
3	5				8 13
	6		5'0"	MIX SAND & CINDEES FULL WET MED. COMPACT	1 6
4	7				3 5 6 6
	8				
5	9				3 5
	10		9'9"	MIX SAND BROWN W/IT SLIGHTLY COMPACT	8 2
6	11				1 1 2 3
	12				
7	13				3 1
	14		13'6"	RIVER BOTTOM MOIST SOFT	1 3
8	15		14'0"	MED. SAND BROWN W/IT MED. COMPACT	2 2 2 3
	16				
4	17		16'0"	MED. SAND BROWN & VEGETATION MOIST SLIGHTLY COMPACT	1 1 1
	18				
10	19		18'0"	MED. SAND GREY & SILT MOIST COMPACT	3 6 6
	20				28 65
11	21		20'0"	MED. TO COARSE SAND BROWN W/IT EX. COMPACT	64 45 13
12	22				11
	23				17
13	24				25 26
5	25		24'6"	CLAY GREY W/IT MOIST EX. STIFF OVER	19 55

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 3.5
ELEVATION _____

DATE 8-10-82

PROJECT S.E.

LOCATION _____

ST. LOUIS

CREW CHIEF LIPPY HELPER GOVER

GROUND WATER OBSERVATIONS		
G.W. ENCOUNTERED AT	<u>4</u>	FT. <u>0</u> INS.
G.W. ENCOUNTERED AT		FT. _____ INS.
G.W. AFTER COMPLETION	<u>4</u>	FT. <u>0</u> INS.
G.W. AFTER	HRS. _____	FT. _____ INS.
G.W. VOLUMES <u>HEAVY</u>		

Start taking routine penetration tes. 3.16 fcu. abov. 3 min. apr. 3 min.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.) Blows / 6"</small>	Penetration
	0				
	1			MIX SAND & CLAY FILL MOIST	
	2				
	3				
	4				
	5			4'0" MIX SAND & CLAY FILL WET	
	6				
	7				
	8				
	9				
	10			9'0" RIVER BOTTOM	
	11				
	12			11'6" PIAT	
	13				
	14				
	15				
	16				
	17			16'0" MRD SAND GREY WET & STRIPES OF PIAT	
	18				
	19				
	20				
	21			20'0" SANDY CLAY GREY W.P. MOIST	
	22			↓ 21' END OF HOLE	
	23				
	24				
	25				

SPECIAL TYPE OR SPLIT SPOON R.C.—ROCK CORE OTHER—

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 4

ELEVATION _____

DATE 8-9-82

PROJECT S.E.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	<u>6</u>	FT.	<u>0</u>
G.W. ENCOUNTERED AT	<u>13</u>	FT.	<u>0</u>
G.W. AFTER COMPLETION	<u>9</u>	FT.	<u>0</u>
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>HEAVY</u>		

Start taking routine penetration ... One

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 5"	Penetration
	0				
1	1			MIX SAND & CLAY FILL MOIST VARY STIFF	7
	2				7
	3				9
2	3		2'0"	MED. SAND BROWN FILL MOIST COMPACT	10
	4				11
	5				8
3	5				6
	6				6
	7				4
4	7		6'0"	MIX. SAND FILL WET SLIGHTLY COMPACT	3
	8				4
	9				4
5	9		8'0"	MIX SAND & CINDERS FILL WET SLIGHTLY COMPACT	1
	10				2
	11				2
6	11				1
	12				1
	13		11'0"	PEAT MOIST SOFT	3
7	13				2
	14				1
	15				1
8	15		13'0"	MED. SAND BROWN & CLAY CONTANT WET MED. COMPACT	1
	16				1
	17				1
9	17		14'0"	SILTY SAND BROWN WET COMPACT	3
	18				2
	19				2
	20				6
10	20		17'0"	SANDY CLAY GRAY W.P. MOIST VARY STIFF	10
	21				9
	22				8
11	22		18'0"	SANDY CLAY GRAY W.P. & LAYERS OF SAND MOIST EX. STIFF	15
	23				6
	24				12
12	24		20'0"	SANDY CLAY GRAY & STONES MOIST EX. STIFF	23
	25				23
	26				44
	27				62
	28				40
	29				80
	30				166
				↓ 23' END OF HOLE	

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DEW 4.5

ELEVATION _____

DATE 8-9-82

PROJECT S.I.E.

LOCATION _____

ST LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	3	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	2	FT.	6	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES <u>HENRY</u>				

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small> Blows/5"	Penetration
	0				
	1			MIX SAND & CINDERS FILL NOIST	
	2				
	3				
	4		3'0"	MIX SAND & CINDERS FILL WET	
	5				
	6				
	7		6'6"	RIVER BOTTOM	
	8				
	9				
	10				
	11				
	12		11'0"	MID. SAND BROWN WET	
	13				
	14				
	15				
	16		15'0"	SANDY CLAY GRAY MOIST	
	17				
	18				
	19			18' END OF HOLE	
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

DATE 8-9-82

BORING NO. DGW 5

PROJECT S.E.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER COVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	3	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	2	FT.	6	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES <u>4.750V</u>				

Sample Elev.	Depth . 0	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 6"	Penetration
1 SS	1			MIX SAND & CINDERS FILL MOIST VERY COMPACT	2 7 10
	2				9 7
2 SS	3				3 3
	4		3'0"	MIX SAND & CINDERS FILL WET MED. COMPACT	4 3 3
SS	5				4 3
	6				4
4 SS	7		6'0"	LIVER BOTTOM GREAT MOIST SOFT	2 1 1
	8				2
5 SS	9				1 1
	10				1 1
6 SS	11				1 1
	12		11'0"	SILT & SAND BROWN WET VERY COMPACT	7 11
7	13		12'0"	SANDY CLAY BROWN MOIST STIFF	6 5 5
	14		13'6"	SANDY CLAY GRAY MOIST STIFF	7 6 8 10 15
8 SS	15				10 15
	16				19
9 SS	17				26
	18			17'6" END OF HOLE	
	19				
	20				
	21				
	22			13.5-17.5' A. Montgomery MDNR 8-9-82	
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS

LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 5.5

ELEVATION _____

DATE 8-9-82

PROJECT T.E.

LOCATION _____

ST LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	3	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	3	FT.	0	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES	<u>High</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6"	Penetration
	0					
	1			MIX SAND & CINDERS FILL MOIST		
	2					
	3					
	4			3'0" MIX SAND & CINDERS FILL WET		
	5					
	6					
	7			6'0" RIVER BOTTOM		
	8					
	9			8'0" MED. SAND BROWN WET		
	10					
	11					
	12					
	13			12'0" SANDY CLAY GRAY MOIST		
	14			↓		
	15			14' END OF HOLE		
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. D6W 6

DATE 8-9-82

ELEVATION _____

PROJECT S.I.E.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOYER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	1	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	1	FT.	0	INS.
G.W. AFTER		HRS.		FT.
G.W. VOLUMES	<u>HEAVY</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.) Blows / 6"</small>	Penetration
	0				
1 SS	1			MIX SAND & CONCRETE FILL MOIST MED. COMPACT	2 57
	2			1'0" MIX SAND & CINDARS FILL WET COMPACT	5 7
2 SS	3			2'6" MED. SAND BROWN WET VARY COMPACT	4 2
	4				2
3 SS	5				17 6
	6				8
4 SS	7			6'6" SANDY CLAY GRAY MOIST STIFF	10 3
5 SS	8				4
	9				5
6 SS	10				9
	11			↓ 10' END OF HOLE	11 6
	12				9
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25			0-10' <u>D. Montgomery</u> <u>MDUR 8-9-82</u>	

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDISTURBED LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

DATE 8-9-82

BORING NO. DGW 7

PROJECT S.E.

ELEVATION _____

LOCATION _____

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	2	FT.	6
G.W. ENCOUNTERED AT		FT.	6
G.W. AFTER COMPLETION	2	FT.	6
G.W. AFTER		MRS.	FT.
G.W. VOLUMES	<u>HEAVY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Blows / 5" Penetration
	0				
1	1			MIX SAND & CINDERS FILL MOIST MED. COMPACT	10
	2				10
2	3		2'6"	MIX SAND & CINDERS FILL WET MED. COMPACT	10
	4				10
3	5		5'0"	SANDY CLAY BROWN MOIST STIFF	10
	6				10
4	7				10
	8		7'0"	SANDY CLAY BROWN MOIST VERY STIFF	18
	9			↓ 8' END OF HOLE	
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 7.5

DATE 0-9-47

ELEVATION _____

PROJECT _____

LOCATION _____

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT.	0
G.W. ENCOUNTERED AT		FT.	
G.W. AFTER COMPLETION	3	FT.	0
G.W. AFTER		FT.	
HRS.			
G.W. VOLUMES	<u>HEAVY</u>		

CREW CHIEF LIPAY HELPER GOVIER

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 5"	Penetration
	0				
	1			MIX SAND & CINDEES FILL MOIST	
	2				
	3				
	4		3'0"	MIX SAND & CINDEES FILL WET	
	5				
	6				
	7		6'0"	RIVER BOTTOM	
	8		7'6"	SANDY CLAY BROWN MOIST	
	9			8'6" END OF HOLE	
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 8
ELEVATION _____

DATE 8-9-82

PROJECT S.E.

LOCATION _____

ST LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	4	FT.	0
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	4	FT.	0
G.W. AFTER		HRS.	INS.
G.W. VOLUMES	<u>HEAVY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Blows/5" Penetration
	0				
1	1	SS		MIX SAND & CINDERS FILL MOIST COMPACT	3
	2				5
	3	2			6
	4			3'0" MIX SAND FILL MOIST COMPACT	13
	5				13
	6	SS		4'0" MIX SAND & CINDERS FILL WET VERY COMPACT	9
	7				7
	8				1
	9	H		6'0" MIX SAND & CINDERS FILL WET SLIGHTLY COMPACT	3
	10	SS			13
	11				10
	12				1
	13			11'0" SANDY CLAY BROWN MOIST VERY STIFF	1
	14	SS			1
	15				1
	16				1
	17				1
	18				1
	19				1
	20				1
	21				1
	22				1
	23				1
	24				1
	25				1
	26				1
	27				1
	28				1
	29				1
	30				1
	31				1
	32				1
	33				1
	34				1
	35				1
	36				1
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	55				1
	56				1
	57				1
	58				1
	59				1
	60				1
	61				1
	62				1
	63				1
	64				1
	65				1
	66				1
	67				1
	68				1
	69				1
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	71				1
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	73				1
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	77				1
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	83				1
	84				1
	85				1
	86				1
	87				1
	88				1
	89				1
	90				1
	91				1
	92				1
	93				1
	94				1
	95				1
	96				1
	97				1
	98				1
	99				1
	100				1

↓ 16' END OF HOLE

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 9

ELEVATION _____

DATE 8-9-92

PROJECT S.E.

LOCATION _____

ST. LOUIS

CREW CHIEF LIPPY HELPER GOVERN

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	<u>11</u>	FT.	<u>0</u>	INS.
G.W. ENCOUNTERED AT		FT.	<u>0</u>	INS.
G.W. AFTER COMPLETION	<u>4</u>	FT.		INS.
G.W. AFTER	<u>HRS.</u>	FT.		INS.
G.W. VOLUMES	<u>HEAVY</u>			

Start taking routine penetration test one foot above nominal depth & drive 10.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6"	Penetration
	0					
<u>1</u> SS	1			<u>MIX SAND FILL MOIST COMPACT</u>		<u>9</u>
	2					<u>10</u>
<u>2</u> SS	3					<u>11</u>
	4					<u>12</u>
<u>3</u> SS	5		<u>4'0"</u>	<u>MIX SAND & CINDERS FILL WET MED. COMPACT</u>		<u>13</u>
	6					<u>14</u>
<u>4</u> SS	7					<u>15</u>
	8		<u>7'0"</u>	<u>SANDY CLAY BROWN MOIST STIFF</u>		<u>16</u>
<u>5</u> SS	9					<u>17</u>
	10		<u>8'0"</u>	<u>SILTY CLAY BROWN MOIST STIFF</u>		<u>18</u>
<u>6</u> SS	11					<u>19</u>
	12		<u>10'0"</u>	<u>SILTY CLAY BROWN MOIST VERY STIFF</u>		<u>20</u>
	13					<u>21</u>
	14					<u>22</u>
	15					<u>23</u>
	16					<u>24</u>
	17					<u>25</u>
	18					<u>26</u>
	19					<u>27</u>
	20					<u>28</u>
	21					<u>29</u>
	22					<u>30</u>
	23					<u>31</u>
	24					<u>32</u>
	25					<u>33</u>
						<u>34</u>
						<u>35</u>
						<u>36</u>
						<u>37</u>
						<u>38</u>
						<u>39</u>
						<u>40</u>
						<u>41</u>
						<u>42</u>
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						<u>45</u>
						<u>46</u>
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						<u>91</u>
						<u>92</u>
						<u>93</u>
						<u>94</u>
						<u>95</u>
						<u>96</u>
						<u>97</u>
						<u>98</u>
						<u>99</u>
						<u>100</u>

12 FT END OF HOLE

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. D.S.W. 10.5

ELEVATION _____

DATE 8-10-52

PROJECT S.E.I.

LOCATION _____

ST. LOUIS

CREW CHIEF LIPPIN HELPER COVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	3	FT.	6	INS.
G.W. ENCOUNTERED AT		FT.	6	INS.
G.W. AFTER COMPLETION	3	FT.	6	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES	<u>HEAVY</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows/6" Penetration
	0				
	1			FINE SAND & GRAVEL FILL MOIST	
	2				
	3				
	4		3'6"	FINE SAND & GRAVEL FILL WET	
	5				
	6		5'6"	RIVER BOTTOM	
	7				
	8				
	9				
	10		9'0"	SANDY CLAY BELOW MOIST 9' END OF HOLE	
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. D.G.W. 11.5

DATE 5-10-42

ELEVATION _____

PROJECT S.F.

LOCATION _____

ST LOUIS

CREW CHIEF LIPPY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	<u>5</u>	FT.	<u>0</u> INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	<u>5</u>	FT.	<u>0</u> INS.
G.W. AFTER		HRS.	FT. INS.
G.W. VOLUMES	<u>HEAVY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6"	Penetration
	0					
	1			<u>MED. SAND FILL MOIST</u>		
	2					
	3					
	4					
	5					
	6			<u>5'0" M G O FILL WET</u>		
	7					
	8					
	9					
	10					
	11			<u>10'0" SANDY CLAY GRAY U.P.</u>		
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

↓
14' END OF HOLE

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 12

ELEVATION _____

DATE 8-10-82

PROJECT S.E.

LOCATION ST LOUIS

CREW CHIEF LIPBY HELPER GOVEL

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 5 FT. 6 INS.
 G.W. ENCOUNTERED AT _____ FT. _____ INS.
 G.W. AFTER COMPLETION 6 FT. 0 INS.
 G.W. AFTER _____ HRS. _____ FT. _____ INS.
 G.W. VOLUMES HEAVY

Start taking routine penetration test one foot above nominal depth & ...

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Blows / 5"	Penetration
	0					
1	1			MIX SAND FILL MOIST EX. COMPACT		7
SS						13
	2					17
						13
	3					8
	4					8
3	5					8
SS						6
	6		5'6"	MIX SAND FILL WET COMPACT		5
4	7		6'0"	MED. SAND TO COARSE BROWN WET SLIGHTLY COMPACT		3
CL						4
	8					1
						2
5	9					1
SS						2
	10		9'0"	RIVER BOTTOM		2
						5
6	11					6
SS						8
	12		11'0"	MED. SAND BROWN WET COMPACT		1
						1
7	13		12'0"	MED. SAND BROWN WET SLIGHTLY COMPACT		1
SS						3
	14					16
						21
8	15		14'0"	COARSE SAND GRAY WET EX. COMPACT		23
SS						25
	16					20
9	17		16'0"	SANDY CLAY GRAY MOIST & LAYERS OF MED. SAND EX. STIFF		60
SS						19
10	18		17'6"	SANDY CLAY GRAY W.P. EX. STIFF		57
SS						80
	19					42
10						49
SS	20					29
SS						40
	21			20'6" END OF HOLE		
	22					
	23					
	24					
	25					

FROM R.C. - ROCK CORE OTHER -

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 13
ELEVATION _____

DATE 8-10-82

OBJECT S.E.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	5	FT.	6
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	5	FT.	6
G.W. AFTER		FT.	INS.
G.W. VOLUMES	<u>HEAVY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 5"	Penetration
	0					
1	1			MIX SAND FILL MOIST EX. COMPACT		11
SS	2					17
	3					15
	4					14
	5					10
	6			2'0" MIX SAND FILL MOIST VERY COMPACT		10
	7					8
	8					9
3	9					5
SS	10					3
	11			5'6" MIX SAND & CINDERS FILL WET MED. COMPACT		3
4	12					2
SS	13			6'6" RIVER BOTTOM		3
	14					7
	15			7'3" MED. SAND BROWN WET VERY COMPACT		10
5	16					4
SS	17			8'0" COARSE SAND BROWN WET VERY COMPACT		7
	18					7
	19					10
6	20					3
SS	21					6
	22					10
	23					10
7	24			12'0" COARSE SAND BROWN WET EX. COMPACT		10
SS	25					20
	26					41
	27			13'7" SANDY CLAY GRAY W.P. MOIST EX. STIFF		83
8	28					26
SS	29					65
9	30					41
SS	31					135
10	32					36
SS	33					73
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
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	93					
	94					
	95					
	96					
	97					
	98					
	99					
	100					

Start taking routine penetration test with 100'...

↓
17' END OF HOLE

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DCW 11
ELEVATION _____

DATE 8-10-82

PROJECT S.I.E.

LOCATION _____

St. Louis

CREW CHIEF LIBBY HELPER COOPER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	1'	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	4	FT.	0	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES	<u>HEADY</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows/5"	Penetration
	0				
1 SS	1			1 1/2" SAND STONES & L. CL. ... MOIST ...	15 19 15
	2				20 15 20
2 SS	3				23 13
	4				1
3 SS	6			4 1/2" MED FINE W. SLIGHTLY COMPACT	1 1 1
	8				1 1
4 SS	7				1 1
	8			7 1/2" RIVER BOTTOM	1 2
5 SS	9				3 4 3
	10				4
6 SS	11			10 1/2" MED. SAND BROWN WBT EX. COMPACT	5 10 30
	12			11 1/2" SANDY CLAY GRAY W.P. MOIST EX. STIFF	20 8 18 23 5 1/2
7 SS	13				22 1/2 55
	14				
8 SS	16				
	18			15' 6" END OF HOLE	
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

Soils taken (out) to Michigan State Univ. Dept. of Geology

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DCW 14
ELEVATION _____

DATE 8-10-82

PROJECT S.E.

LOCATION _____

ST. LOUIS

CREW CHIEF LARRY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	5	FT.	0
G.W. ENCOUNTERED AT		FT.	
G.W. AFTER COMPLETION	5	FT.	0
G.W. AFTER		HRS.	
G.W. VOLUMES	<u>HEAVY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 6"	Penetration
	0				
1 SS	1			MIX SAND FILL MOIST COMPACT	3 4 5
	2				6
2 SS	3		2'6"	MIX SAND & CINDERS FILL MOIST VERY COMPACT	8 10 12
	4				5
3 SS	5				4
	6		5'0"	MED. SAND BROWN WET COMPACT	4 3
4 SS	7		6'0"	COARSE SAND BROWN WET VERY COMPACT	3 2
	8				12
5 SS	9		8'0"	COARSE SAND GRAY WET VERY COMPACT	3 5
	10				12
6 SS	11		10'0"	COARSE SAND BROWN WET EX. COMPACT	14 16
	12				18 25
7 SS	13				8 19
	14		13'6"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	36 110
8 SS	15				34 36
9 SS	16				72 38
	17			16'6" END OF HOLE	60
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

SPLIT TUBE S.S.—SPLIT SPOON R.C.—ROCK CORE OTHER—

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. D&W 15
ELEVATION _____

DATE 8-11-82

PROJECT S.F.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVIER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	FT.	INS.	
G.W. ENCOUNTERED AT	FT.	INS.	
G.W. AFTER COMPLETION	4 FT.	0 INS.	
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES <u>2.75</u>			

Start taking routine penetration test one foot above nominal depth of drive

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 6"	Penetration
	0				
1 SS	1			MIX SAND & CLAY FILL MOIST COMPACT	2
	2		1'6"	MIX SAND & CINDERS FILL MOIST COMPACT	4
2 SS	3				3
	4				6
3 SS	5		4'0"	MIX SAND & CINDERS FILL WET SLIGHTLY COMPACT	3
	6				3
4 SS	7		5'0"	RED SAND FILL WET COMPACT	5
	8				4
5 SS	9		7'0"	RED SAND FILL WET VERY COMPACT	12
	10				3
6 SS	11		10'0"	COARSE SAND BROWN WET EX. COMPACT	5
	12				9
7 SS	13				12
	14		13'6"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	10
8 SS	15				17
9 SS	16				14
10 SS	17			▼ 16'6" END OF HOLE	20
	18				14
	19				25
	20				110
	21				175
	22				
	23				
	24				
	25				

SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS

LOG OF SOIL BORING

JOB NO. _____

BORING NO. DEW 16

ELEVATION _____

DATE 8-11-92

PROJECT S.F.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	5	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	5	FT.	0	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES	<u>HEAVY</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.) Blows / 5"</small>	Penetration
	0				
1 SS	1			MIX SAND & STONES FILL MOIST SIMPLY COMPACT	3 7
	2				2
2 SS	3				2
	4		3'9"	MIX SAND & CINDERS FILL MOIST COMPACT	2
3 SS	5				3
	6		5'0"	MIX SAND & CINDERS FILL WET COMPACT	4
4 SS	7		6'0"	MIX SAND & CINDERS FILL WET MOD. COMPACT	3
	8				2
5 SS	9		7'6"	MIX SAND & CINDERS FILL WET EX. COMPACT	3
	10				4
6 SS	11		10'0"	COARSE SAND BROWN WET VERY COMPACT	5
	12				7
7 SS	13		12'0"	COARSE SAND BROWN WET EX. COMPACT	14
	14				26
8 SS	15		14'6"	SANDY CLAY BROWN MOIST EX. STIFF	14
	16		15'0"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	26
9 SS	17				43
	18			↓ 17'6" END OF HOLE	70
	19				21
	20				35
	21				58
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 17
ELEVATION _____

DATE 8-11-82

PROJECT S.I.E.

LOCATION ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	5	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	5	FT.	0	INS.
G.W. AFTER		HRS.		FT.
G.W. VOLUMES	<u>HEAVY</u>			INS.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows/5"	Penetration
1	0					
SS	1			MIX SAND & CINDERS FILL MOIST SLIGHTLY COMPACT	2	3
	2				1	4
2	3		2'0"	MIX SAND CINDERS STONES & BRICK FILL MOIST EX. COMPACT	20	31
	4				20	50
3	5				17	11
	6		5'0"	MIX SAND & CINDERS FILL WET VERY COMPACT	7	7
4	7				1	3
SS	8		6'0"	MIX SAND CINDERS & CLAY FILL WET VERY COMPACT	12	12
	9				8	13
5	10		8'6"	SANDY CLAY BROWN MOIST EX. STIFF	26	26
	11		9'0"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	7	17
6	12		10'10"	MED. SAND & SILT BROWN WET EX. COMPACT	33	10
	13				25	56
7	14		12'0"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	35	35
SS	15				32	51
8	16					
SS	17					
9	18					
SS	19					
	20					
	21					
	22					
	23					
	24					
	25					

↓
15' END OF HOLE

TYPE OF SAMPLE: (1) - UNDIST. LINER S.T. - SHELBY TUBE S.S. - SPLIT SPOON R.C. - ROCK CORE OTHER -

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 19
ELEVATION _____

DATE 8-1-52
PROJECT S.F.
LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT.	6
G.W. ENCOUNTERED AT		FT.	
G.W. AFTER COMPLETION	3	FT.	0
G.W. AFTER		HRS.	
G.W. VOLUMES	<u>HEAVY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6" Penetration
	0				
1 SS	1			MIX SAND & CLAY FINE MOIST COMPACT	6
	2				7
2 SS	3				5
	4		3'6"	MIX SAND & CINDERS FINE WET COMPACT	2
3 SS	5				3
	6				5
4 SS	7		6'0"	SANDY CLAY BROWN W.P. MOIST EX. STIFF	11
	8				11
	9		8'0"	SANDY CLAY GRAY W.P. FINEST EX. STIFF	20
5 SS	10			↓ 9'6" END OF HOLE	17
	11				5
	12				10
	13				17
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T.-SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW18
ELEVATION _____

DATE 2-11-51

PROJECT _____

LOCATION ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	<u>4</u>	FT.	<u>6</u> INS.
G.W. ENCOUNTERED AT		FT.	<u>6</u> INS.
G.W. AFTER COMPLETION	<u>4</u>	FT.	<u>6</u> INS.
G.W. AFTER		HRS.	FT. INS.
G.W. VOLUMES	<u>HEAVY</u>		

Start taking routine penetration test one (1) ft. above nominal dept. & drive "3".

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows/6"	Penetration
	0				
1 SS	1			MIX SAND CINDERS & STONES FILL MOIST B.X. COMPACT	6 12 14
	2				14
2 SS	3		2'6"	PLASTIC LINER DRUM & SAND & STONES FILL	12 40
	4				21
3 SS	5		4'6"	MIX SAND & CINDERS FILL W.F.T COMPACT	9 7 7
	6				7
4 SS	7		6'0"	COARSE SAND BROWN W.F.T COMPACT	4 3 4
	8				7
5 SS	9		8'0"	FINE SAND & SILT BROWN W.F.T B.X. COMPACT	7 13 26
	10				30
6 SS	11		10'0"	FINE SAND & SILT BROWN W.F.T VERY COMPACT	5 4 4
	12				15
7 SS	13		12'0"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	11 16 29
8 SS	14				25
	15				50
	16			15' END OF HOLE	65
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

SLIT SPOON B.C. - ROCK CORE OTHER -

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 20

DATE 8-11-52

PROJECT S.E.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVEK

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	4	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	4	FT.	0	INS.
G.W. AFTER		HRS.		FT.
G.W. VOLUMES	<u>HEAVY</u>			INS.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.) Blows / 5"</small>	Penetration
	0				
1	1			MIX SAND & CLAY FILL MOIST COMPACT	3
SS	2				6
2	3				6
SS	4				3
3	5		4'-0"	MED. SAND BROWN WAT COMPACT	3
SS	6		5'-0"	SANDY CLAY BROWN MOIST & LAYERS OF MED. SAND BROWN VERY STIFF	2
4	7				6
SS	8				13
5	9				7
SS	10				9
6	11		9'-6"	SANDY CLAY BROWN W.P. MOIST EX. STIFF	12
SS	12		11'-6"	SANDY CLAY GREY W.P. MOIST EX. STIFF	13
7	13			12'-6" END OF HOLE	22
SS	14				33
	15				8
	16				15
	17				25
	18				41
	19				50
	20				
	21				
	22				
	23				
	24				
	25				

Just taking routine penetration

TYPE OF SAMPLE: D - DISTURBED U.L. - UNDIST. LINER S.T. - SHELBY TUBE S.S. - SPLIT SPOON R.C. - ROCK CORE OTHER -

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

DATE 9-12-52

BORING NO. DGW 21

PROJECT S.I.E.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT.	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	3	FT.	INS.
G.W. AFTER		HRS.	FT.
G.W. VOLUMES			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 6"	Penetration
	0				
1 SS	1			MIX SAND & CLAY FILL MOIST MED. COMPACT	2
	2				2
2 SS	3		2'0"	RIVER BED 7 CM	2
	4		3'3"	MED. SAND BROWN W.P. LOOSE CONTENT	3
3 SS	5		4'0"	MED. SAND BROWN W.P. LOOSE CONTENT	3
	6				3
4 SS	7		6'0"	SANDY CLAY BROWN W.P. MOIST EX. STIFF	8
	8		7'6"	SANDY CLAY BROWN W.P. MOIST EX. STIFF	11
5 SS	9				8
	10				16
6 SS	10				9
	11		10'3"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	22
	12			↓ 10'6" END OF HOLE	30
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

Star sing time p. atral test foc. above minimal depth & give 10.

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

DATE 01-12-52

BORING NO. DGW 22

PROJECT _____

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF L. H. HAY HELPER COVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	3	FT.	10	INS.
G.W. ENCOUNTERED AT		FT.	0	INS.
G.W. AFTER COMPLETION	4	FT.		INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES	<u>Heavy</u>			

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 6" Penetration
	0				
1	1			MIX SAND FILL MOIST MED. COMPACT	3
SS					4
	2				4
	3				3
2	3		2'6"	SANDY SILTY CLAY BOTTOM MOIST SOFT	2
SS					1
	4		3'10"	MED. SAND BROWN WET & CLAY CONTENT MED. COMPACT	3
3	5		4'10"	SILTY CLAY VARIEGATED MOIST FIRM	2
SS					2
	6				1
4	7				2
SS					2
	8		7'8"	MED. SAND BROWN WET COMPACT	5
5	9		8'0"	SILTY CLAY BROWN MOIST STIFF	9
SS			8'6"	MED. SAND BROWN WET COMPACT	5
	10		9'6"	SANDY CLAY BROWN MOIST W.P. VERY STIFF	11
6	11		10'10"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	14
SS					8
	12		11'0"	MED. SAND BROWN & STONES WET EX. COMPACT	18
7	13		11'6"	SANDY CLAY GRAY MED. MOIST EX. STIFF	25
SS					20
	14				39
8	15				60
SS					25
	16			↓	49
	17			14'6" END OF HOLE	76
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				
	26				

Start taking routine penetration test one foot above nominal depth of drill.

TYPE OF SAMPLE: D - DISTURBED U.L. - UNDIST. LINER S.T. - SHELBY TUBE S.S. - SPLIT SPOON R.C. - ROCK CORE OTHER -

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 23
ELEVATION _____

DATE 8-12-82

PROJECT S.E.

LOCATION ST. LOUIS

CREW CHIEF LIPBY HELPER COOPER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	5	FT.	6	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	5	FT.	6	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES <u>HEAVY</u>				

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.) Blows / 6"	Penetration
	0				
1 SS	1			MIX SAND & CLAY FILL MOIST STIFF	7
	2				5
2 SS	3		2'0"	MIX SAND & CLAY FILL MOIST SOFT	5
	4				4
3 SS	5				3
	6				2
4 SS	7		5'6"	MIX SAND & CINDERS FILL WET COMPACT	2
	8				1
5 SS	9		6'6"	MIX SAND & CINDERS FILL WET VERY COMPACT	2
	10				1
6 SS	11		9'10"	SANDY CLAY GREY W.P. MOIST STIFF	7
	12		10'6"	SANDY CLAY GREY W.P. MOIST VERY STIFF	7
7 S	13		12'0"	SANDY CLAY GREY W.P. MOIST EX. STIFF	3
	14			↓ 13' END OF HOLE	9
	15				15
	16				10
	17				14
	18				23
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 24

ELEVATION _____

DATE 8-17-82

PROJECT S.I.E.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER FOVIER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	3	FT. 6	INS.
G.W. ENCOUNTERED AT		FT.	INS.
G.W. AFTER COMPLETION	3	FT. 6	INS.
G.W. AFTER	HRS.	FT.	INS.
G.W. VOLUMES	<u>HRACY</u>		

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small> Blows / 6"	Penetration
	0				
1	1			MIX SAND & CLAY FILL MOIST M.P. COMPACT	2
	2				3
2	3				4
	4		3'6"	MIX SAND & CINDERS FILL WET COMPACT	5
3	5		4'0"	M.P. SAND BROWN WHT COMPACT	6
	6		5'6"	SANDY CLAY GRAY MOIST STIFF	7
4	7				8
5	8		7'6"	SANDY CLAY GRAY W.P. MOIST VERY STIFF	9
	9			↓ 9' END OF HOLE	10
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

TYPE OF SAMPLE: D.-DISTURBED U.L.-UNDIST. LINER S.T. - SHELBY TUBE S.S.-SPLIT SPOON R.C.-ROCK CORE OTHER-

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____

BORING NO. DGW 25

DATE 8-17-82

PROJECT S.E.

ELEVATION _____

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS				
G.W. ENCOUNTERED AT	1	FT.	0	INS.
G.W. ENCOUNTERED AT		FT.		INS.
G.W. AFTER COMPLETION	0	FT.	6	INS.
G.W. AFTER		HRS.		INS.
G.W. VOLUMES <u>HEAVY</u>				

Sample Elev.	Depth	Legend	Depth of Change	Soil Description <small>(Density, Moisture, Color, Texture, etc.)</small>	Blows / 6"	Penetration
	0					
1 SS	1			MIX SAND FILL MOIST SLIGHTLY COMPACT	12	12
	2		1'0"	MIX SAND FILL WRT SLIGHTLY COMPACT	1	1
2 SS	3				1/2	1/2
	4				1	1
	5		4'0"	CONCRETE		
3 SS	6		5'0"	SILT GRAY MOIST & STONES MOIST VERY COMPACT	11	11
	7				40	40
4 SS	8		7'0"	SANDY CLAY GRAY W.P. MOIST EX. STIFF	11	11
	9				9	9
5 SS	10				4	4
	11			↓	18	18
	12			10' END OF HOLE	10	10
	13				23	23
	14				28	28
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12" 13" 14" 15" 16" 17" 18" 19" 20" 21" 22" 23" 24" 25"

TYPE OF SAMPLE: _____

MICHIGAN TESTING ENGINEERS, INC.

GEOPHYSICAL ENGINEERS
LOG OF SOIL BORING

JOB NO. _____
BORING NO. DGW 26
ELEVATION _____

DATE 8-18-82

PROJECT SIE.

LOCATION _____

ST. LOUIS

CREW CHIEF LIBBY HELPER GOVER

GROUND WATER OBSERVATIONS			
G.W. ENCOUNTERED AT	5	FT.	0
G.W. ENCOUNTERED AT		FT.	0
G.W. AFTER COMPLETION	5	FT.	0
G.W. AFTER		HRS.	0
G.W. VOLUMES	<u>HEAVY</u>		

Start taking routine penetration test one foot above nominal depth & write in.

Sample Elev.	Depth	Legend	Depth of Change	Soil Description (Density, Moisture, Color, Texture, etc.)	Blows / 5"	Penetration
	0					
1 SS	1			MIX SAND & TOPSOIL MOIST FILL SLIGHTLY COMPACT		2
	2					3
2 S	3					1
	4					2
3 SS	5		3'6"	SILTY SANDY CLAY BROWN W.P. MOIST STIFF		3
	6					4
4 SS	7					4
	8					2
5 SS	9		8'6"	SILTY CLAY BROWN W.P. MOIST VERY STIFF		2
	10					6
	11			↓ 10' END OF HOLE		12
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					

- SOIL CODE OTHER -