HANSON
ENGINEERING P.C.
Soils, Foundations & Underground Specialists

Report On

Final Slurry Wall Design
Containment Barrier
Wall Installation

MIDCO I SITE

Gary, Indiana

Prepared for:

CONTRACT DEWATERING, INC.

Prepared By:

HANSON ENGINEERING, P.C.

Project No. 03144-011

November 17, 2003

HANSON
ENGINEERING P.C.
Soils, Foundation & Underground Specialists

November 20, 2003
Project Number 03144-011

Mr. Richard Neumann
Contract Dewatering, Inc.
5820 West Riverside Drive
P.O. Box 1
Saranac, Michigan 48881

Re: Clarification of Slump and Permeability Sampling Intervals
Containment Barrier Wall (CBW) Installation
Midco I Site
7400 West Fifteenth Avenue
Gary, Indiana

Dear Mr. Neumann:

As a followup to our telephone conversations with you and Ms. Cynthia Bonczkiewicz, P.E. of ENVIRON today, this letter will serve to clarify the slump testing and permeability sampling required for the referenced project. In our design report we stated that one slump and one permeability sample would be obtained for every 600 cubic yards (every 80 feet) of CBW. The 600 cubic yard interval conforms to Table 3-4 from "Evaluation of Subsurface Engineered Barriers at Waste Sites" EPA 542-R-98-005 August 1998. The interval along the wall should have stated approximately every 240 feet instead of every 80 feet. The final report that is to be submitted after all reviews have been completed will indicate the interval to be approximately every 240 feet.

It is hoped this information is sufficient to fulfill your present requirements. Should you have any questions or require additional information, please do not hesitate to call. We look forward to working with you on this project.

Very truly yours,
HANSON ENGINEERING, P.C.

Barney L. Thomas, P.E.
Project Manager

Daniel L. Hanson, P.E.
Principal Engineer

40595 Koppernick Road o Canton, MI 48187 o *Phone:* (734) 454-6560 o *Fax:* (734) 454-7423

HANSON
ENGINEERING P.C.
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November 20, 2003
Project Number 03144-011

Mr. Richard Neumann
Contract Dewatering, Inc.
5820 West Riverside Drive
P.O. Box 1
Saranac, Michigan 48881

Re: Submittal for Road Crossing Design Change
Containment Barrier Wall (CBW) Installation
Midco I Site
7400 West Fifteenth Avenue
Gary, Indiana

Dear Mr. Neumann:

As a follow-up to our telephone conversations, we are enclosing details for a proposed design change at the road crossings. The change involves placing a bentonite Volclay® CR bentonite panel over the Shoreguard sheeting interlocks after the sheeting has been installed instead of solvent welding the sheeting before placing the sheets in the CBW. The Volclay® CR bentonite panels are to be installed on the sheeting side that faces to the outside of the CBW. The Volclay® CR bentonite panels have been specified since the bentonite used is designed to be used where contaminated groundwater or high levels of salt concentrations are in the water. By using the Volclay® CR bentonite panels at the interlocks seepage through the interlock locations would be small considering the minimal void space at the interlocks as well as the low permeability of the Volclay® CR bentonite panels. Technical information regarding the Volclay® CR bentonite panels is included with this letter.

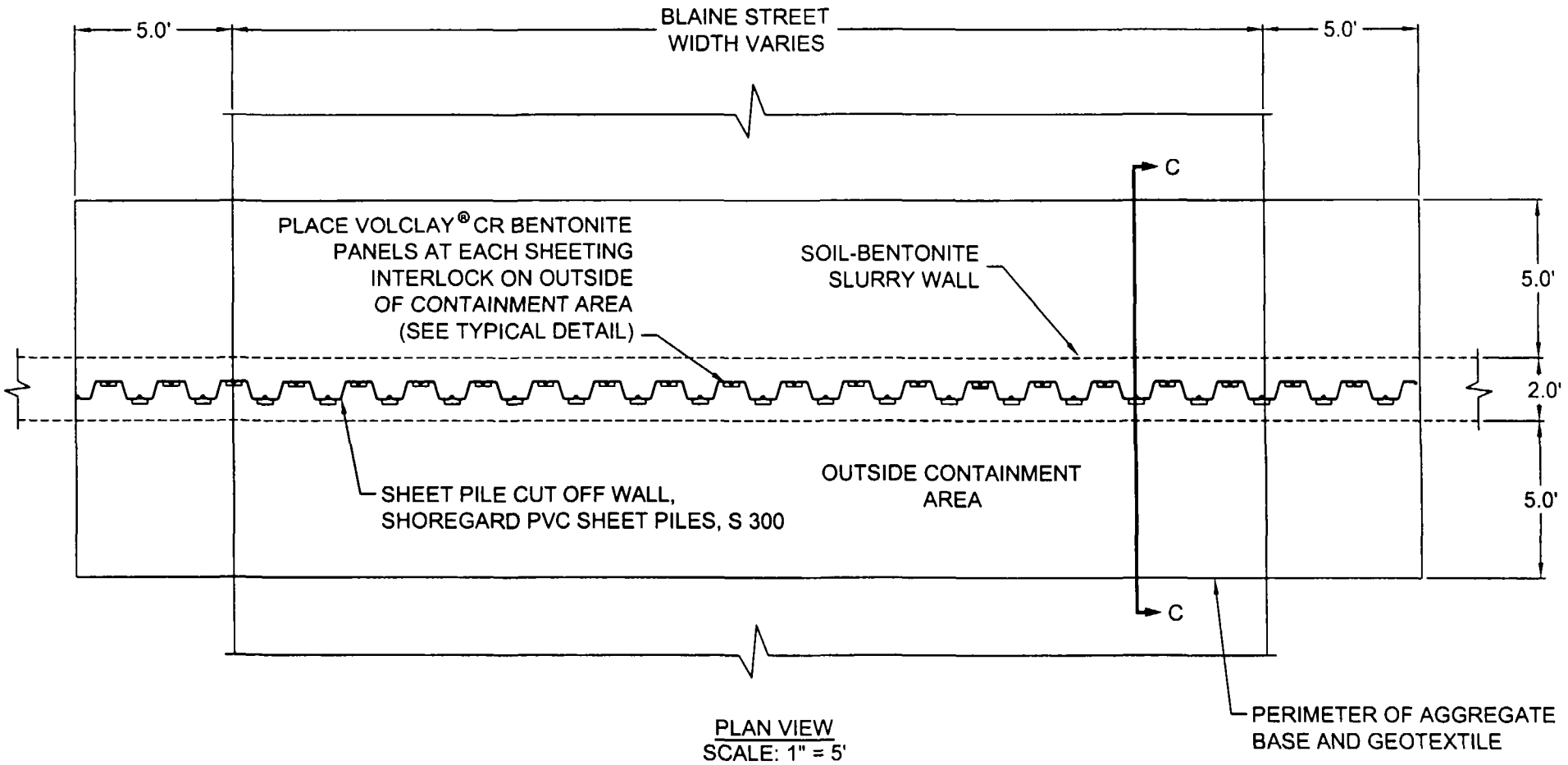
It is hoped this information is sufficient to fulfill your present requirements. Should you have any questions or require additional information, please do not hesitate to call. We look forward to working with you on this project.

Very truly yours,
HANSON ENGINEERING, P.C.

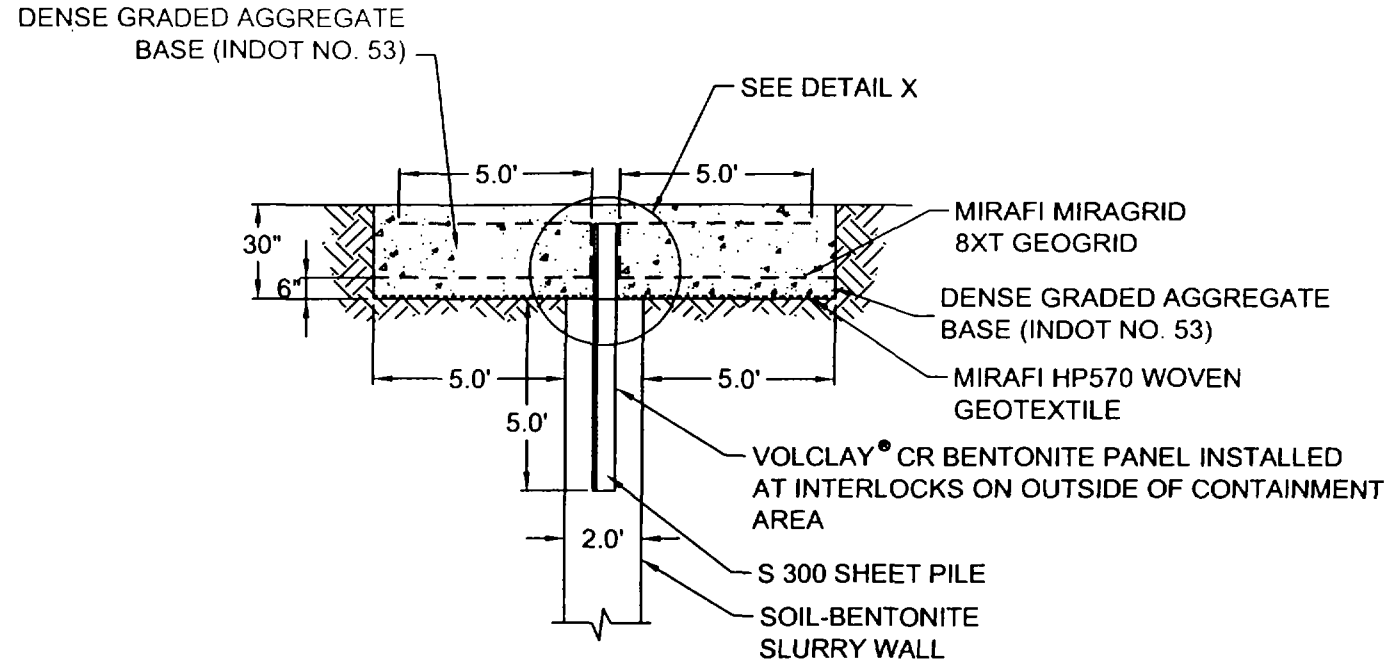
Barney L. Thomas, P.E.
Project Manager

Daniel L. Hanson, P.E.
Principal Engineer

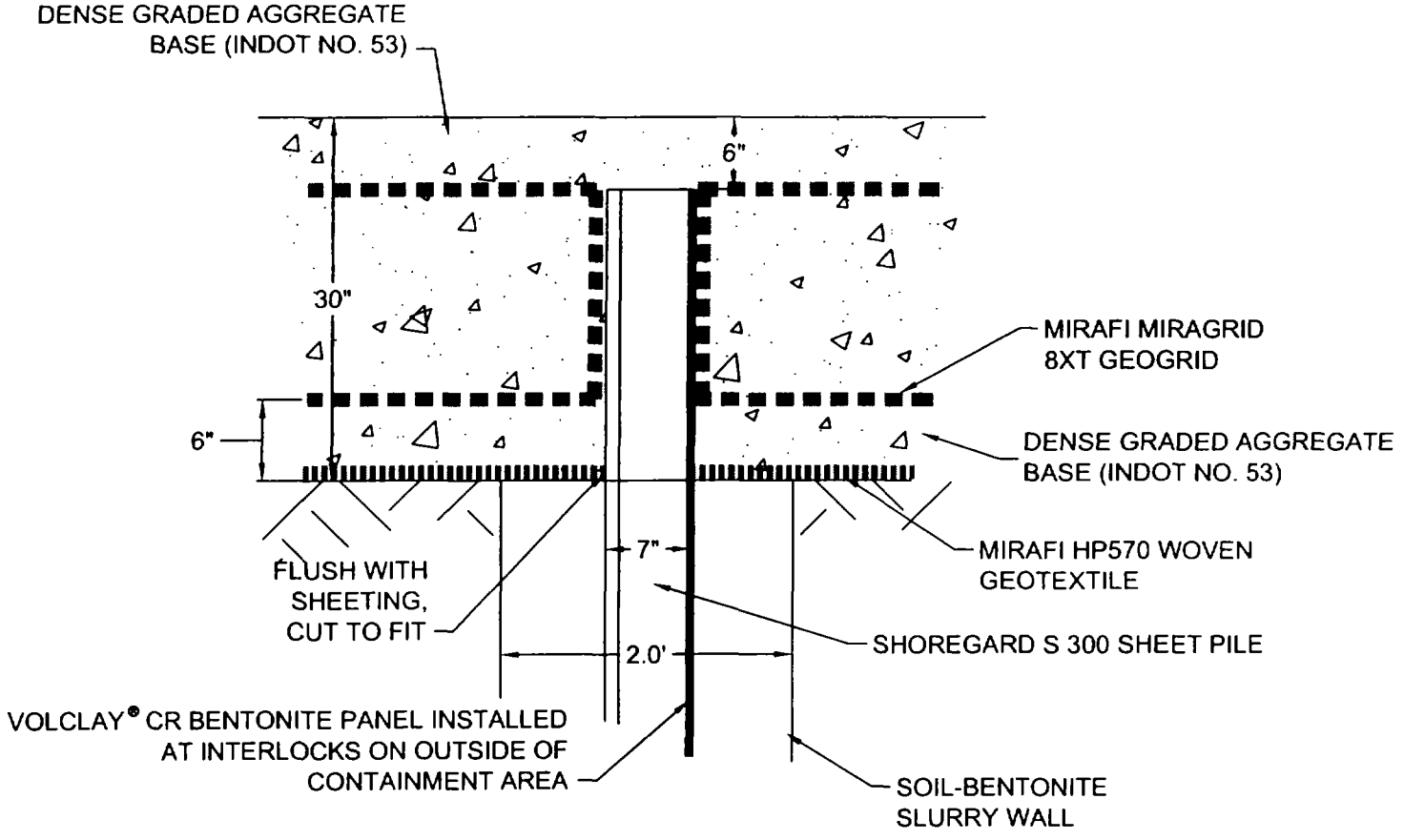
40595 Koppernick Road o Canton, MI 48187 o *Phone:* (734) 454-6560 o *Fax:* (734) 454-7423



ROAD CROSSING DETAILS
PAGE 1 OF 3

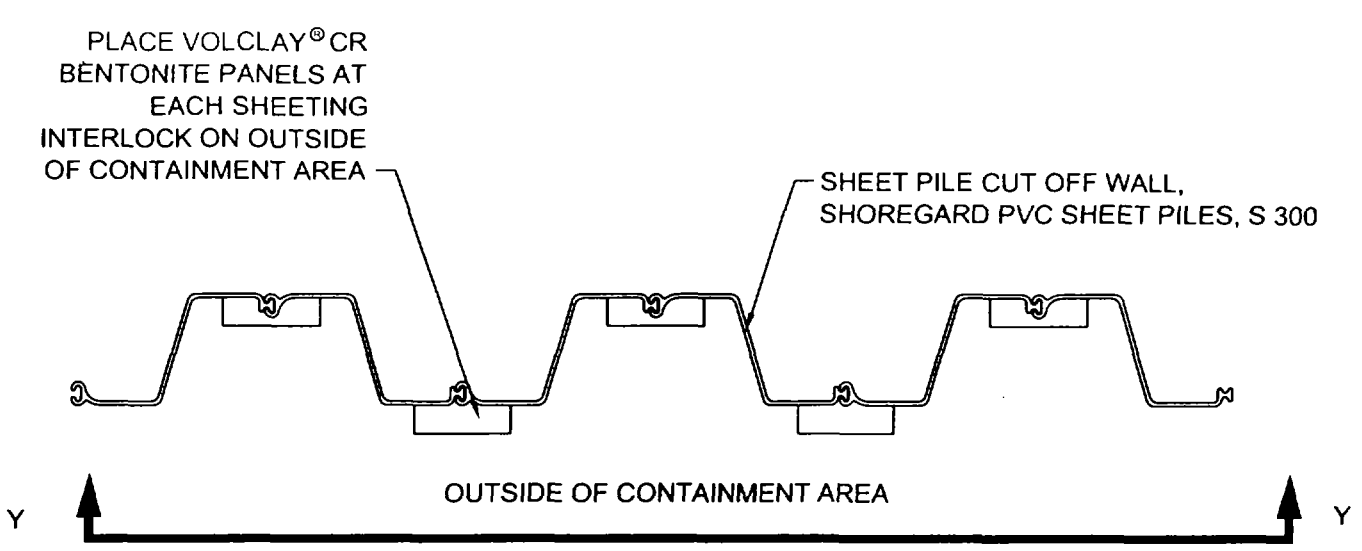


SECTION C-C
SCALE: 1" = 5'

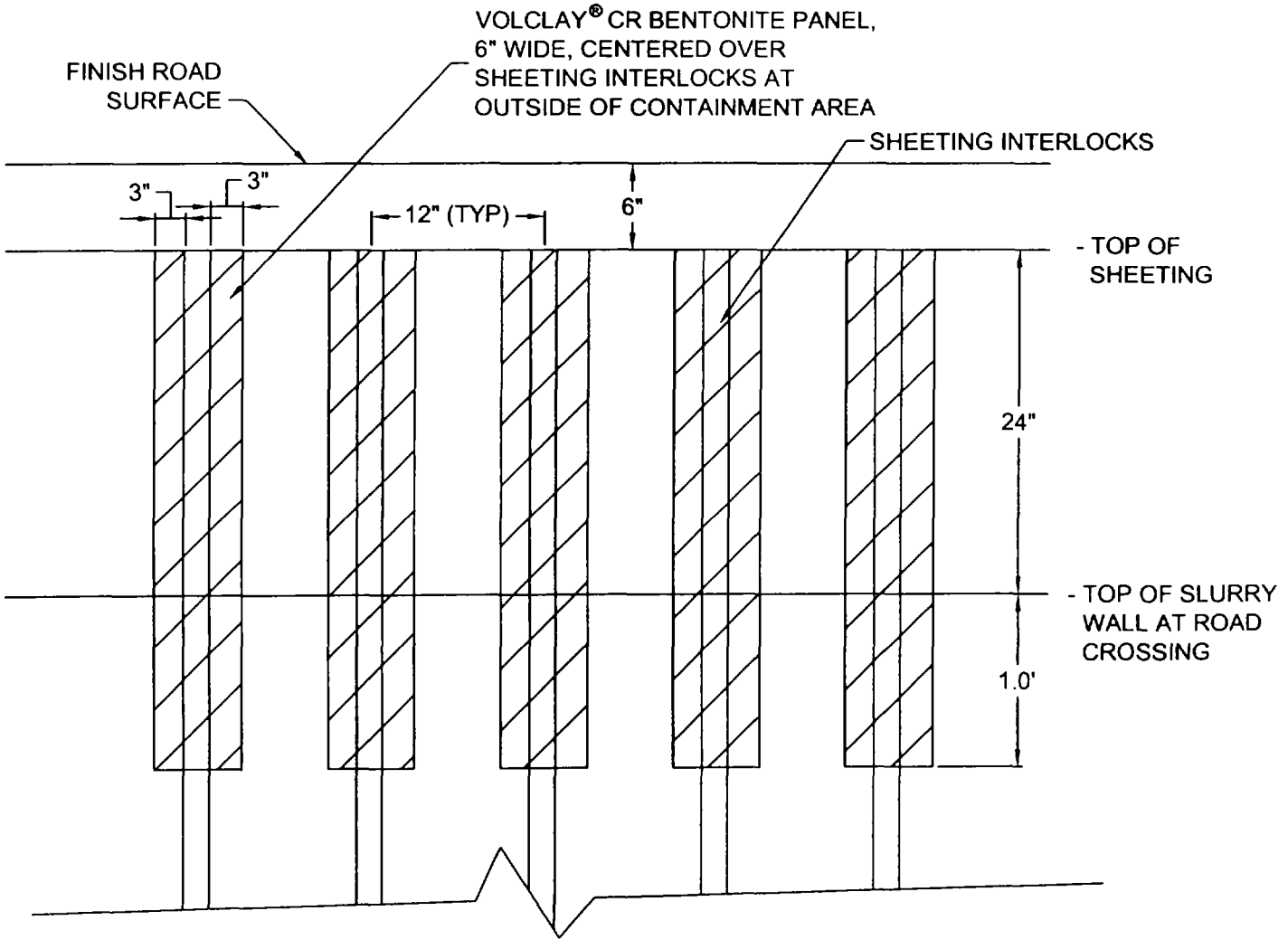


DETAIL X
SCALE: NONE

ROAD CROSSING DETAILS
PAGE 2 OF 3



VOLCLAY PANEL INSTALLATION DETAIL
SCALE: 1" = 1'



SECTION Y-Y
SCALE: 1" = 1'

ROAD CROSSING DETAILS
PAGE 3 OF 3

VOLCLAY PANELS®
BENTONITE WATERPROOFING SYSTEM

TECH DATA

DESCRIPTION
Volclay Panels are a highly effective waterproofing system composed of a biodegradable kraft board filled with high-swelling, sodium bentonite. Volclay Panels contain a controlled rate of 1 pound per square foot (4.8 kg/m²) of Volclay sodium bentonite inside the flutes of the 4' x 4' x 3/16" thick (1.2m x 1.2m x 4.7 mm) corrugated kraft board. A special version, Volclay Type 1-C Panel, features a clear, water-resistant coating on the print side of the Panel to inhibit premature hydration of the bentonite from inclement weather prior to backfilling. Once backfilled, Volclay Panels hydrate and form a monolithic waterproofing membrane. Volclay Panels contain zero VOC, can be installed in almost any weather condition to green concrete, and most importantly, have proven effective for more than 35 years.

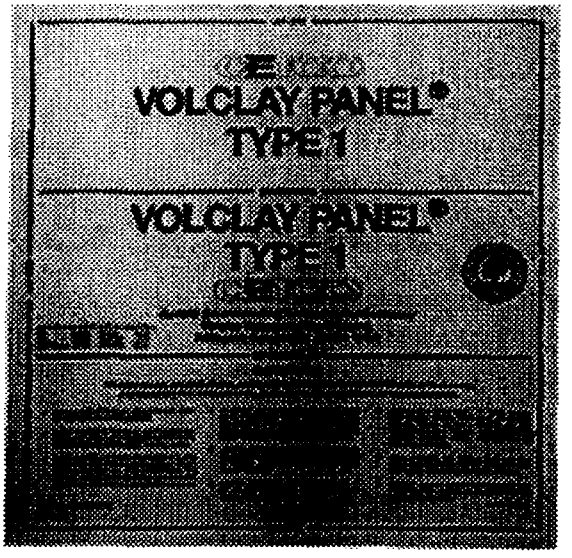
Volclay Panels work by forming a low permeability membrane upon contact with water. When wetted, unconfined bentonite can swell up to 15 times its dry volume. When confined under pressure the swell is controlled, forming a dense, impervious waterproofing membrane. The swelling action of Volclay can self-heal small concrete cracks caused by ground settlement, concrete shrinkage, or seismic action; problems over which there is normally no control.

APPLICATIONS
Volclay Panels are designed for below-grade structural concrete foundation walls. Typical applications include backfilled concrete foundation and retaining walls. Applications may include structures under continuous or intermittent hydrostatic pressure. Volclay Panels are not designed for below-grade masonry block walls.

Where contaminated ground-water or saltwater conditions exist, consult CETCO regarding recommended Volclay waterproofing products and installation guidelines.

INSTALLATION
General: Install Volclay Panels in strict accordance with the manufacturer's installation guidelines. Use accessory products as recommended. Install both Type 1 and Type 1-C Panels with the print side facing the installer. Install Waterstop-RX in all applicable horizontal and vertical concrete construction joints. Schedule waterproofing material installation to permit prompt placement of compactible backfill material. For applications not covered herein, contact CETCO for specific installation guidelines.

THE IDEAL GREEN ARCHITECTURE WATERPROOFING MEMBRANE



Consisting only of a natural mineral and biodegradable kraft board, Volclay Panels are one of the most environmentally friendly waterproofing products making them an ideal choice for green architecture projects.

SIMPLE PRODUCT DESIGN HAS PROVIDED RELIABLE WATERPROOFING SINCE 1963

Volclay Panel corner cut away shows the corrugation flutes of the biodegradable kraft board are filled with 1-lb/sf of granular sodium bentonite.

Preparatory Work: Concrete surfaces should be free of voids and sharp projections. Surface irregularities should be removed before installation. Apply Bentoseal® to form-tie pockets, construction joints and honeycombs in concrete. Tapered form-tie holes extending through the wall should be completely filled with non-shrink grout.

Panel Installation: Starting at a bottom outside corner of the wall, bend Panel around the corner along the "Starter Line" (printed on Panel) with the kraft board corrugations vertically oriented. Cut the Panel at the bottom along the "Starter Line" so that the Panel can be extended onto the footing a minimum of 6" (150 mm). Secure Panels with washerhead concrete fasteners along each edge and one or two fasteners in the center. Cut and apply a Panel section at the footing corner base where the Panel does not cover. Then apply Bentoseal over the Panel section at the corner. After securing the corner Panel, install adjacent Panels with corrugations (and print) horizontally oriented. Overlap all adjoining Panel edges a minimum of 1-1/2" (38 mm) and extend onto footing a minimum of 6" (150 mm). Continue horizontal placement until the next corner. At the next corner install the Panel with print vertical. At the inside corners, apply a continuous 3/4" (18 mm) fillet of Bentoseal directly in the corner prior to installing the Panels.

Place Hydrobar Tubes tight against the Panel along the wall/footing intersection at the bottom of the wall. "Butt" Hydrobar Tube ends together and tamp a shovel of backfill over them immediately to prevent displacement. Replace any damaged or prehydrated materials prior to backfilling.

Begin the next course at the original outside corner by positioning the Panel at the corner along the "Alternate Line" (printed on Panel) overlapping the previous course a minimum 1-1/2" (38 mm). After securing the corner Panel, install adjacent Panels with kraft board corrugations and print horizontally oriented. Overlap all adjoining Panel edges a minimum of 1-1/2" (38 mm). Repeat Panel installation procedure to finished grade level.

To closely fit around penetrations, cut Panels parallel with the corrugations. Immediately seal open Panel corrugation edge by applying a small amount of water with a wet cloth or sponge prior to Panel installation. Trowel a minimum 1/2" (12 mm) thick layer of Bentoseal around penetrations. Extend Bentoseal onto penetration and completely fill area between Panel edge and penetration.

Terminate Panels at finished grade with a rigid termination bar fastened 12" (300 mm) on center. Embed top edge of Panels in 2" (50 mm) wide, by 1/2" (12 mm) thick layer of Bentoseal. A 12" (300 mm) wide strip of UV resistant flashing material is also recommended to be installed over the top edge of the Panels at grade.

Backfill material should be compacted to 85% of Modified Proctor density immediately following the application of each Panel course. Backfill to within 3" (75 mm) of the top edge of the Panel. If backfill cannot be applied immediately, protect Type 1 Panels (non-coated) from precipitation with polyethylene sheeting. Remove sheeting prior to backfilling. If backfill contains sharp or irregular material, cover Panels with Protection Mat 10V or Aquadrain® drainage composite to avoid damage during backfilling and compaction.

Tie into underslab waterproofing as required by overlapping the underslab waterproofing a minimum of 6" (150 mm). When a drain tile is required, install it below the top of the footing - not in direct contact with the waterproofing.

SIZE AND PACKAGING

Volclay Type 1 and Type 1-C Panels are 48" x 48" x 3/16" thick (1.2m x 1.2m x 4.7 mm). Each Panel weighs approximately 18 lbs. (8 kg). Volclay Panels are packaged 125 panels per pallet; 2000 sq. ft. (185 sq.m.) per pallet.

Storage: Keep all Volclay materials dry, with adequate polyethylene or canvas cover for sides and top. Block up or pallet materials to prevent contact with ground surface water.

TECHNICAL DATA

Volclay sodium bentonite is composed of a minimum of 90% high-swelling montmorillonite.

Permeability Rating: Volclay Panels have been tested by independent testing laboratories in accordance with ASTM D 5084, and have a measured permeability of 1×10^{-9} cm/sec.

Hydrostatic Resistance: A single course of Volclay Panels is rated to withstand 33' (10 m) of hydrostatic head. For hydrostatic conditions greater than 33' (10 m), a double course of Volclay Panels is required.

Crack Bridging Ability: Laboratory testing has shown that Volclay Panels are capable of bridging cracks in concrete up to 1/16" (1.5 mm).

Free Swell Rating: 2 grams of sodium bentonite sifted into deionized water swells a minimum volume of 16 cc.

Bentonite Mass per Unit Area: ASTM D 3776 (mod), 1.0 pound per square foot (4.8 kg/m²).

ACCESSORY PRODUCTS

Volclay Panel System accessories include:

BENTOSEAL®: patented trowel grade sodium bentonite compound used as a detailing mastic around penetrations and corner transitions. Bentoseal is packaged in 3 gallon pails (36 lbs (16.34 Kg)).

HYDROBAR TUBE®: 2" (50 mm) diameter x 24" (610 mm) long, water soluble casing tube filled with Volclay Bentonite. It is used as a convenient method of adding extra bentonite at the footing/wall intersection. Hydrobar Tube is packaged 32' (9.7 m) per carton.

WATERSTOPPAGE®: pure granular Volclay Bentonite used to detail critical areas that may require extra Volclay protection. Waterstoppage is packaged in 50 lb. (22.70 Kg) bags.

AQUADRAIN®: prefabricated drainage composite consisting of a heavy filter fabric adhered to a high-strength polystyrene drainage core. Aquadrain is available in 4' x 52' rolls.

PROTECTION MAT 10V: heavy geotexile protection course materials that protect installed Volclay Panels from backfill damage.

WATERSTOP-RX®: expanding bentonite-based concrete joint strip waterstop designed to replace PVC dumbbell waterstops. Waterstop-RX is manufactured in flexible strips that are adhered into place with Volclay WB-Adhesive. Also place Waterstop-RX around applicable penetrations.

LIMITATIONS

Do not install Volclay Panels in standing water or during precipitation. If ground water contains strong acids, alkalies, or is of a conductivity of 2,500 µmhos or greater, submit water samples to the manufacturer for compatibility testing. If contaminated ground-water or saltwater conditions exist, consult CETCO regarding recommended Volclay waterproofing products and installation guidelines.

Volclay Panels are not designed for unconfined above-grade waterproofing applications or below-grade masonry block foundation walls. Do not install Volclay Panels in horizontal split-slab plaza deck applications that will receive a poured concrete wear surface or other solid topping.

Volclay panels are not designed for below-grade masonry block foundation walls, with or without a cementituous parget . Consult CETCO regarding recommended Volclay waterproofing products and installation guidelines.

Volclay Panels are not designed to waterproof expansion joints. Expansion joints require a properly engineered expansion joint sealant product manufactured by other companies.

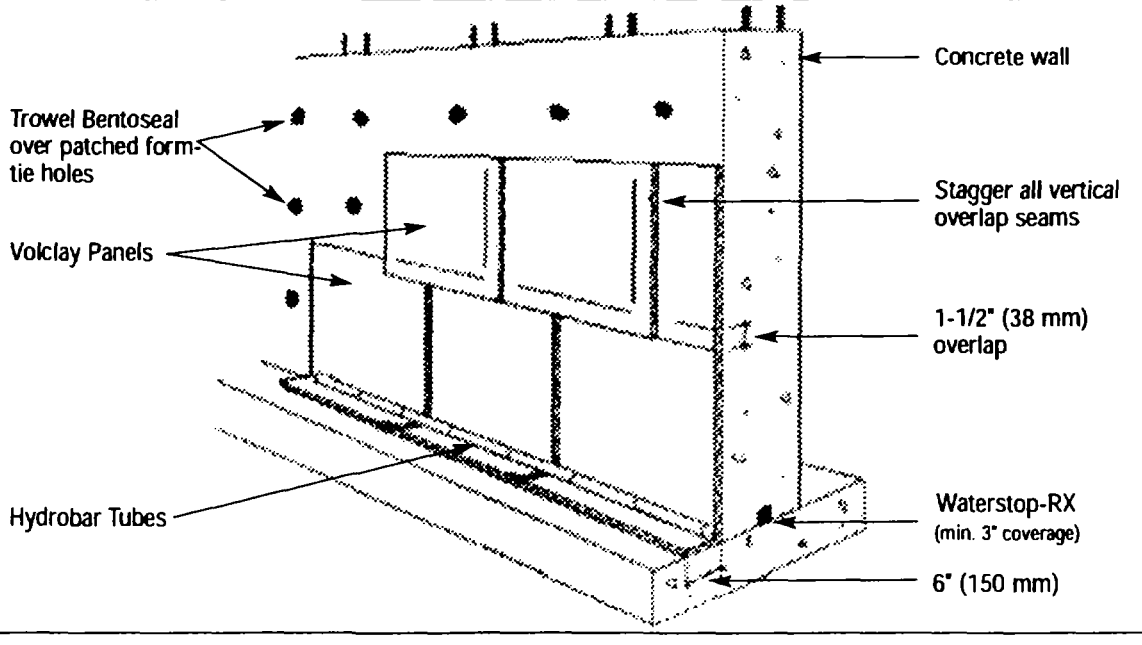
Backfill should consist of compactible soils, pea gravel, or crushed stone (3/4" or less). Compact soils to minimum 85% Modified Proctor density. Stone backfill larger than 3/4" (18 mm) may require the use of a protection course; consult CETCO for specific guidelines. Avoid backfill with aggregate larger than 1-1/2" (38 mm).

USGBC - INDUSTRY PARTNER

CETCO is an Industry Partner of the US Green Building Council (USGBC). USGBC is a national, committee based, consensus organization representing a full cross section of the building industry whose mission is to accelerate the adoption of green building practices, technologies, policies, and standards through market based solutions. USGBC's primary vehicle for promoting sustainable design and construction is the LEED Rating System (LEED - Leadership in Energy and Environmental Design). The LEED Rating System has been developed in response to the U.S. market's demand for a definition of "green building".

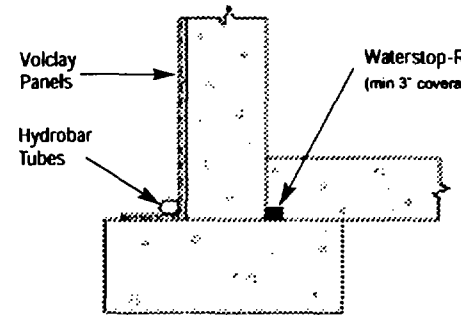
Volclay Panels, consisting solely of natural sodium bentonite carried in a biodegradable kraft board, is one of the most environmentally friendly waterproofing materials in the world. Containing no volatile organic compounds (VOCs) Volclay Panels have been used successfully on thousands of projects worldwide.

BACKFILLED CONCRETE WALL DETAIL

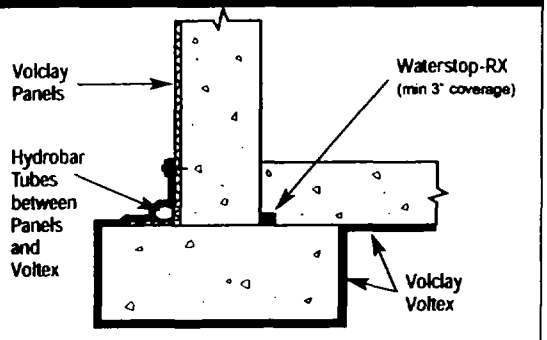


VOLCLAY® PANEL WATERPROOFING
GENERAL APPLICATION DETAILS

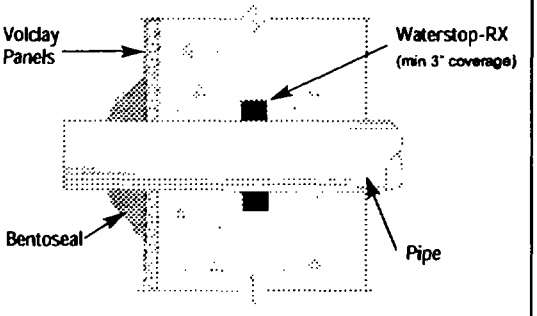
NON-HYDROSTATIC CONDITION



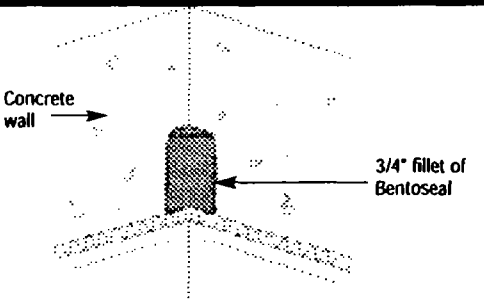
HYDROSTATIC CONDITION



WALL PENETRATION DETAIL

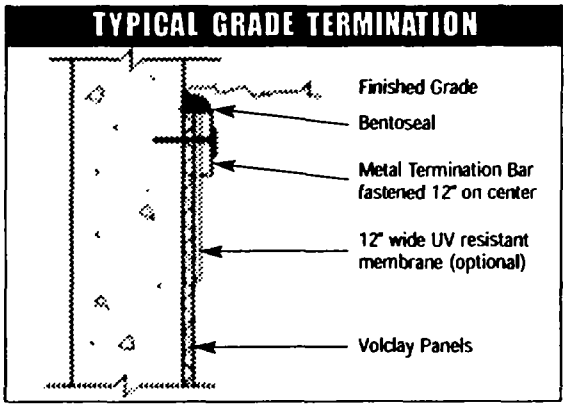


INSIDE CORNER DETAIL



Bend Volclay Panel to fit corner

TYPICAL GRADE TERMINATION



SEPTEMBER 2002
(Supersedes All Previous Versions)

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Printed on recycled paper

[PRODUCT SPECIFICATIONS]

VOLCLAY PANELS PRODUCT SPECIFICATIONS

PANEL SPECIFICATIONS

Bentonite Content	1 lb./ft2 (4.8 kg/m^2)
Dry Thickness	0.187 inch (4.8 mm)
Panel Width	4 feet (1.2 m)
Panel Height	4 feet (1.2 m)
Typical Panel Weight	18 lbs. (8.1 kg)

SODIUM BENTONITE

Granular Size	90% passing 20 Seive 10% passing 200 Seive
Type	90% Montmorillinite 10% Unaltered Volcanic Sediment
Free Swell Rating	2 grams swell to 16cc volume in deionized water

PHYSICAL PROPERTIES

Property	Test Method Typical Property
Permeability	ASTM D 5084 1 x 10^{-9} cm/sec.
Puncture Resistance	ASTM D 781 95 lbs. (422 N)

PACKAGING	125 Panels per pallet.2000 square feet per pallet (185.8 square meters per pallet)
TYPE 1-C (COATED) PANELS	Type 1-C Panels have a temporary water-resistant coating applied to the print side of the Panel. The clear coating inhibits premature hydration from inclement weather prior to backfilling or concrete placement. Once backfilled, the Type 1-C Panel will hydrate normally, forming a seamless waterproofing membrane. Type 1-C Panels (one-side coated) are designed for both vertical and horizontal applications.

Applicaions | General Specifications | Product Specifications | Accessory Products| Details | Project References

Products | Product Literature/Technical Data Sheets | Advantages | Bentonite WP Abstract | FAQs | Map/Contacts

Visit Other CETCO Divisions Parent Company and Subsidiaries

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For questions regarding this site, contact webmaster@cetco.com

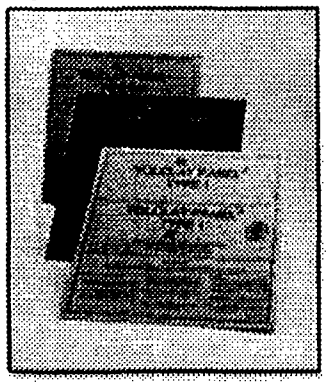
bentonite activates and stops the water.

Swelltite is easy to install. It can be applied in most weather conditions to freshly poured concrete without a primer or adhesive. Swelltite is manufactured in a controlled thickness to assure the contractor, design professional and owner of a proper waterproofing installation. The products unique composite eliminates the use of a release paper and the tough HDPE liner eliminates the need for a protection course for most installations.

Quality and ease of installation have made Swelltite a market leader. Over 50 million square feet of Swelltite have been installed worldwide on projects such as airports, commercial buildings, transportation tunnels and military facilities.

Applications | General Specifications | Product Specifications | Accessory Products | Details | Project References

VOLCLAY PANELS®



Introduced in 1963, Volclay Panels® quickly became the standard for bentonite waterproofing worldwide. Today, after 500,000,000 square feet installed, they still form the foundation of CETCO's integrated waterproofing systems. The flutes of these special 4' x 4' corrugated kraft panels are filled with Volclay® sodium bentonite, assuring a controlled one pound per square foot application of waterproofing material.

Volclay® Type 1 Panels are designed for both vertical and horizontal below-grade waterproofing applications. Applications include backfilled concrete foundation walls, property line construction and installation under floor slabs. A special version, Type 1-C Panel, features a temporary, water-resistant coating on one-side to inhibit premature hydration from inclement weather prior to backfilling or concrete placement. Once backfilled the coated panel will hydrate normally, forming a monolithic waterproofing membrane.

For installations where groundwater is contaminated or has a high level of salt concentration, specify the Panels with Volclay® CR bentonite. Volclay® CR is a specially treated contaminant resistant sodium bentonite that assures optimum performance in contaminated groundwater conditions.

Applicaions | General Specifications | Product Specifications | Accessory Products| Details | Project References

Bentogrout®

HANSON
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Soils, Foundation & Underground Specialists

November 17, 2003
Project No. 03144-011

Mr. Richard Neumann
Contract Dewatering, Inc.
5820 West Riverside Drive
P.O. Box 1
Saranac, Michigan 48881

Re: Report on Final Containment Barrier Wall Design
Midco I Site
7400 West Fifteenth Avenue
Gary, Indiana

Dear Mr. Neumann:

In accordance with your request, we have reviewed the project Request for Bid Proposal package prepared by ENVIRON for the above referenced project for construction of a containment barrier wall. The containment barrier wall installation portion of the project is located at the Midwest Solvent Recovery, Inc. (Midco I) which is at 7400 West 15th Avenue in Gary, Indiana.

The containment barrier wall is to be located approximately 8 feet inside the west and south fence surrounding the exclusion boundary. This location was approved by Mr. Richard Boice of the USEPA during the 50 percent design submittal meeting held at the site on October 13, 2003. The fence located at the north and east boundaries of the exclusion zone are to be relocated approximately 15 to 20 feet beyond the current exclusion zone boundaries. The containment barrier wall along the north boundary will follow the general alignment of the existing fence. Along the east side the containment wall will follow the general alignment of the southern portion of the fence and continue in the north-south direction beyond the point where the fence angles to the northwest.

The objective of the containment barrier wall is to provide a continuous, vertical hydraulic cutoff wall to isolate subsurface contamination, prevent migration of contamination, and allow dewatering to proceed with minimal influx of groundwater from outside of the wall. In addition, the containment barrier wall must maintain a hydraulic conductivity of less than 1×10^{-7} cm/sec. The design of the containment wall needs to account for the fact that the wall will be exposed to known contaminants for an extended period of time. Lowering of the groundwater level inside the containment barrier wall area will result in isolated or broad areas that are completely dewatered, resulting in a potential of approximately 26 feet to 30 feet of hydraulic head on the containment barrier wall. Following dewatering, certain areas within the containment wall will be treated with

soil vapor extraction. The containment barrier wall is to be designed for a minimum period of 30 years.

Site Geologic Conditions

Based on the data presented in the "Health and Safety Plan (HASP) for Remedial Design/Remedial Action, Midco I and II Sites; Gary, Indiana" prepared by Environmental Resources Management (ERM) – North Central, Inc. and dated May 14, 1993, the site geology is relatively uniform. Additional subsurface information in the form of boring records was provided by ENVIRON. The boring locations are either within the confines of the proposed containment barrier wall or within approximately 100 feet of the containment barrier wall. Four borings (B-30, B-90, C-30, and F-30) were completed at this site in 1985 by Geosciences Research Associates, Inc. In 1993 Environmental Resources Management – North Central, Inc. completed seven borings (SB-2, SB-3, SB-4, SB-5, SB-8, SB-P, and SB-R) within or near the alignment of the containment barrier wall. Geosciences also completed one boring (E-200) in 1985 at a location approximately 1000 feet north of the exclusion zone. This boring indicates the presence of the confining layer to a depth of approximately 140 feet (EL 470). Additionally, four borings (CDB-1 through CDB-4) were completed by Contract Dewatering Services on October 1, 2003 along the alignment of the containment wall. All of the boring logs previously mentioned are included in Appendix A.

Based upon elevation data provided by ENVIRON, the ground surface elevation in the vicinity of the containment barrier wall alignment ranges from approximately Elevation 598.7 to 603.7. Elevations are NGVD Datum.

The soil profiles presented in the soil boring logs indicate that the upper 25 to 29 feet (to approximate EL 572 to 575) generally consists of fine to medium sands with occasional pockets of sand and gravel. Along the south eastern portion of the containment area, 4 to 6 feet of fill was noted above the sand. The fill consisted of sand, slag, wood and other miscellaneous debris. The sands makeup the uppermost aquifer of the region described as the Calumet Aquifer. The hydraulic conductivities calculated from slug tests performed in the monitoring wells located within the Calumet Aquifer at the Midco I site ranged from 1.9×10^{-4} to 7.5×10^{-3} cm/sec. Underlying the sands at the site is silty clay that extends to the termination depth of boring B-90 at 95 feet (approximate EL 505.7) and to approximately EL 470 in a boring (E-200) that is located approximately 1000 feet north of the Midco I site. Hydraulic conductivity tests were performed on samples of the silty clay layer (key material) with the results indicating that the silty clay deposit exhibited a permeability ranging from 8.5×10^{-8} to 1.0×10^{-6} cm/sec.

Contaminant Concentrations in Groundwater

Included in the ERM-HASP was Table 1-3 "Range of Concentrations of Compounds Detected In Soils, Sediment, Groundwater, and Surface Water During the Remedial Investigation Midco I Site". For completeness, we have included a copy of this table in Appendix B.

Containment Barrier Wall (CBW) Design

The objective of the containment barrier wall (CBW) is to provide a continuous, vertical, hydraulic cutoff to isolate subsurface contamination, prevent migration of contamination, and allow dewatering to proceed with minimal influx of groundwater from outside of the wall. The containment wall must extend from the ground surface into the underlying silty clay stratum (key material) encountered below approximately Elevation 572 to 575. The CBW must have a hydraulic conductivity of less than 1×10^{-7} cm/sec and a design life of 30 years. The maximum potential hydraulic gradient that may exist across the wall is 30 feet.

Contract Dewatering Services, Inc. has proposed to construct a mixed in place soil-bentonite wall constructed using a one pass trencher. The proposal is to place dry bentonite into a shallow pre-trench and then mix the bentonite with the existing soils utilizing a 24 inch diameter wide trencher. Potable water from a nearby fire hydrant will be mixed with the soil and dry bentonite to achieve a uniform mix with a slump in the range of 4 to 8 inches.

Due to the relatively high concentrations of chloride along the west wall as a result of the salt storage at the adjacent INDOT service yard, the bentonite that will be used in the soil-bentonite of the north, south, and west legs of the CBW will be Wyo-Ben SW-101. This bentonite is designed specifically for use where it is exposed to seawater and salt contaminated environments. For the east leg of the CBW, the bentonite used will be Hydrogel. Along the east leg the chloride concentrations are less than 4,000 ppm. The manufacturer of the Hydrogel has indicated that this product will not be impacted by this level of chloride concentration. Product information sheets for these bentonite materials are included in Appendix C.

The criteria for the evaluation of a containment barrier wall design against acceptable industry practices are presented in Appendix D of this design report. This criterion is established in Table 3-2 from the EPA publication "Evaluation of Subsurface Engineered Barriers at Waste Sites" (EPA 542-R-98-005 August 1998).

Sample Collection and Testing Program for CBW

On October 1, 2003, four auger borings (CDB-1 to CDB-4) were made by Contract Dewatering Services, Inc. (CDS) along the proposed CBW alignment. The alignment of the CBW is generally located along the current fence alignment line surrounding the exclusion zone with the exception of the northeast portion of the wall where the wall will continue so that the CBW will square off at the northeast corner (reference Drawing 03144-011-A). The borings were taken to verify the depth to the surface of the underlying silty clay stratum (key material) and to obtain samples of the sand overlying the silty clay for testing purposes. A composite sample of the sands from the north, south, and west legs of the CBW was obtained for mixing with the SW-101 bentonite. A separate sample was obtained from the east leg for mixing with the Hydrogel bentonite. A sample of the groundwater was obtained on October 8, 2003 from MW-6D and EW-3 for use as the permeant in the soil-bentonite laboratory permeability and compatibility testing. The samples were transported to the offices of Weaver Boos & Gordon LLC for determining the soil-bentonite permeability using the groundwater samples obtained.

The purpose of the laboratory testing is to essentially verify the design previously utilized by CDS at a site located approximately 5 miles south-southeast of the Midco I site where the soil profile above the key-in layer consisted of sands similar to those at Midco I. For the Midco I CBW, two soil-bentonite mixes were made using 4% bentonite by weight of soil. The dry unit weight of the on site sand has been assumed to be 100 pounds per cubic foot (pcf). The laboratory permeability testing began the week of October 9, 2003 and has been continuously ongoing since. The permeability tests are being performed utilizing a falling-head permeameter in accordance with EPA Method 9100, Section 2.6. The purpose of the testing program is to determine the hydraulic conductivity of the 4% soil-bentonite mix using the groundwater samples obtained from the site as the test permeant. At the writing of this report, the testing of the samples with groundwater from the site is on-going and the results of the laboratory permeability testing are as follows:

Bentonite Type	Soil Source	Permeant Source	Hydraulic Conductivity, $k_{20°}$
Hydrogel	E Wall	EW-3	1.1×10^{-8} cm/sec
SW-101	Combined N, S, and W Walls	MW-6D	5.5×10^{-9} cm/sec

The final results of the testing program will be presented in a supplemental letter as soon as they become available. The initial test results for the permeability testing are included in Appendix E.

It should be noted that only two samples were tested as part of the design phase. The primary purpose of the testing is to verify a mix design previously used in the same geologic formation. It should also be noted that the site is quite small, and the soil conditions at this site are uniform. Additionally, 20 permeability tests will be completed of the mixed in-place soil-bentonite since a sample will be obtained for every 600 cubic yards (80 feet) of constructed wall. Therefore, there will be a total of 22 permeability tests completed for this wall and no additional design stage testing is required.

Based on the data developed to date, the amount of dry bentonite to be placed into the two foot wide trench should be equal to 8 pounds per foot of trench depth. The bentonite used will be measured weight of dry material placed into the pre-trench. The soil-bentonite will be mixed with the trencher to achieve a uniform mixture with a slump in the range of 4 to 8 inches.

CBW Location

Figure 5-1 – Work Zones Midco I prepared by ERM (dated 11-4-92), included as Appendix F shows the Midco 1 exclusion zone. The project plans require that the CBW be located so that the entire exclusion zone is surrounded. At the west side of the property the exclusion zone is indicated as along the fence line adjacent to the Indiana Department of Transportation (INDOT) facility. Due to the presence of overhead utility lines adjacent to the INDOT side of the fence, the CBW cannot be installed at the fence line without relocating the utility lines. During the 50 percent design meeting held at the site on October 20, 2003, the representative from the USEPA Region indicated that it would be acceptable to place the CBW as close to the fence as practical (approximately 8 feet). The design location of the CBW is indicated on Hanson Engineering Drawing No. 03144-011-A. A detailed site plan with the actual location of the CBW will be submitted with the "As Built" information at the completion of the project.

CBW Hydraulic Considerations

The CBW will be extended 5 feet into the silty clay stratum (key material), which underlies the site at approximately elevation 572 to 575. The CBW will be 24 inches in width. The depth to the bottom of the trench will be checked once the trencher has passed. The wall will consist of a soil-bentonite mix with a demonstrated hydraulic conductivity of less than 1×10^{-7} cm/sec. The hydraulic conductivity of the native medium sands is estimated to be in the range of 1.9×10^{-4} cm/sec to 7.5×10^{-3} cm/sec based upon slug tests performed at the site and reported in the ERM-HASP. Thus, the soil - bentonite wall will be at least 1900 times less permeable than the native soils. Thus, the 2 foot wide barrier wall extending 5 feet into the underlying silty clay key material has an equivalent thickness of at least 3800 feet of native sands, based on the ratio of the hydraulic conductivity values alone. As long as the CBW is continuously supported by soil on both sides, lowering the water level 30 feet across the wall will have no significant effect on the CBW.

CBW Construction Considerations

As previously stated the construction of the CBW will be by the one pass trencher method. The method of construction is discussed in the CDS Work Plan. A copy of the CDS Work Plan has been included herewith as Appendix G. A copy of the CDS Construction Quality Control (CQC) Plan is also included in Appendix G. As with the barrier wall design, the USEPA has developed criteria for the evaluation of a barrier CQA/CQC against acceptable industry practices. This criterion is established in Table 3-4 from the EPA publication "Evaluation of Subsurface Engineered Barriers at Waste Sites" (EPA 542-R-98-005 August 1998). The content of Table 3-4 along with the level of effort for the various CQC categories provided at the Midco I site are included in Appendix H.

If during the excavation of the pretrench unsuitable material such as obstructions or miscellaneous rubble are encountered, the material will be removed from the area and stockpiled on site. The depth of excavation will be limited and extend only to or slightly below the existing water table. The material stockpiled will be managed by ENVIRON.

The actual construction of the CBW will consist of excavating the pretrench and placing dry bentonite into the pretrench. The trencher will be lowered to the desired depth and hydrant water will be added to the trench and mixing of the bentonite with the supplied water and soils will begin. As a result of this process there will be no fugitive dust that will be created as a result of the trenching operations since the soils will be constantly wet.

The means and methods for daily clean up, area restoration, handling of waste, debris and/or fill materials encountered along the alignment are presented in these plans, together with the sequencing of the work. We are unaware of any special utility or access arrangements which will be required other than the locations where the lines for extraction wells EW-3 and EW-5 will cross the CBW. The approximate location of these lines is indicated on Hanson Engineering Drawing No. 03144-011-A.

CBW Construction Personnel

The specifications require that the design report include the resume of key personnel assigned to this project. This information was previously submitted and will not be reproduced here.

Contractor Health and Safety Plan

The CDS Contractor Health and Safety Plan have been included herewith as Appendix I.

Special Construction Details

Special consideration will be given to the means and methods required to seal subsurface utility penetrations through the area where the CBW is to be constructed. This includes areas where the extraction well lines pass through the CBW alignment. The procedure is to temporarily cut and cap existing utility piping on either side of the CBW alignment prior to reaching them with the trencher. After the trencher has passed the utility will be re-connected. The method that will be used to reconnect the HDPE lines will be to use an electrofusion coupling. The manufacturers' specification sheet for electrofusion couplings is included in Appendix J. Air line piping will be reconnected utilizing a mechanical coupler and then the line will be wrapped with HDPE tape.

We understand that the extraction well line EW-5 has been constructed in a berm which is approximately 4 feet above the surrounding ground surface. The extraction well lines are located at the approximate elevation as the surrounding ground surface outside the berm. For EW-3 the lines are not constructed in a berm. At EW-5 the berm will be reestablished by backfilling with soil that was excavated from the berm area prior to constructing the CBW and the berm restored. A detail for the construction sequence at this type of crossing is included in Appendix J and is also indicated on Hanson Engineering Drawing No. 03144-011-D. At EW-5 the grade will be reestablished by backfilling the excavation with a soil-bentonite slurry to within 1-foot of the surface and then placing the clay cap in the same manner as the rest of the wall. A detail for the construction sequence at this type of crossing is included in Appendix J and is also indicated on Hanson Engineering Drawing No. 03144-011-D.

Another special consideration is installation of cover over the CBW at all locations including the areas where Blaine Street will cross. At all areas except where Blaine Street crosses, the CBW will be capped with a 12-inch thick by 30-inch wide cap constructed of a clayey materials that will be capable of supporting pedestrian traffic. The detail of this section is included in Appendix J and is also included on Hanson Engineering Drawing No. 03144-011-C.

At the road crossings Shoreguard S300 PVC sheetpiles will be placed in the CBW and extend to within 6-inches of the ground surface in order to prevent the flow of groundwater from outside the CBW into the containment area. The sheeting interlocks will be solvent welded for the entire length of the sheeting. Once the sheeting is placed, a Mirafi HP570 Woven Geotextile will be placed at the top of the CBW 30-inches below grade and extend 5 feet beyond the edges of the road and the CBW. Above the geotextile material, INDOT No. 53 will be placed and compacted to form a 6 inch layer. A layer of Mirafi Miragrid 8XT Geogrid will then be placed and the remaining dense graded aggregate, meeting the INDOT No. 53 specification, will be placed over the geogrid in 6-inch lifts and compacted to 100 percent of the AASHTO T-99 maximum density. The detail of this section is included in Appendix J and is also included on Hanson Engineering Drawing No. 03144-011-D.

At the northeast corner of the CBW the existing ground surface is lower than most of the remaining site. At this location we have included a 1-foot berm to raise the existing grades and provide a working platform for the trenching equipment. The detail of this section is included in Appendix J and is also included on Hanson Engineering Drawing No. 03144-011-C.

Containment Barrier Wall Specifications

Specifications for the construction of the CBW have been prepared and are presented herewith as Appendix K.

This report and the CBW mix design have been prepared under the direction of this writer, who is a Licensed Professional Engineer in the State of Indiana. The CBW thickness and depth of penetration into the silty clay deposits underlying the site have been determined by this writer. The CBW alignment and termination locations have been determined based on information provided by others. If the CBW is constructed as outlined in the text of this report, it is my conclusion that the CBW will meet the objectives indicated.

It is hoped that this information is sufficient to fulfill your present requirements. Should you have any questions or require additional information, please do not hesitate to call.

Respectfully submitted,
HANSON ENGINEERING, P.C.

Barney L. Thomas, P.E.
Project Manager

Daniel L. Hanson, P.E.
Principal Engineer

Appendix A

GEOSCIENCES RESEARCH ASSOCIATES, INC.
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627 N. Morton
Bloomington, Indiana 47401 (812) 336-0972

Site MIDCO I
Date 12-11-85
Logged by J. Gilles, R. Aten
Location

Boring No. B-30
Driller K. Hanlon
Elevation 600.85

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	6-12"	12-18"	Recvy. (ft)	Remarks
0.0	2.0	Fill, sd, m, pale br (10 YR 6/3) to	SS			2	1	0/1	1.1	HNU=
		yel br (10 YR 5/4), top 0.5' abund								sl neg
		root								defl
2.0	4.0	Fill, sd, m, yel br (10 YR 5/4) top	SS			3	6	11/12	1.7	HNU=60-7
		0.2', dk yel br (10 YR 3/4) 0.2' to								
		0.8', br (10 YR 5/3), water at 3.8'								
4.0	6.0	Fill, slag, dk gry br (10 YR 4/2)	SS			5	7	5/6	2.0	HNU=
		top 0.3', sd, m, v dk gry br								1.0-2.0
		(10 YR 3/2), organic, 0.3' to 0.5',								
		Sd, m, br (10 YR 5/3) wet								
6.0	8.0	Sd, m, gry br (10 YR 5/2), some	SS			3	4	6/8	2.0	HNU=8.0
		thin gry (10 YR 5/1) lam in bottom								
		0.6'								
8.0	10.0	Sd, m, gry br (10 YR 5/2), Sd, C,	SS			5	5	10/12	2.0	HNU=
		v dk gry br (10 YR 3/2) from 9.8'								3.0-5.0
		to 9.9'								
10.0	12.0	Sd, m-f, gry br (10 YR 5/2)	SS			6	10	15/2	2.0	HNU=
										3.0-4.0
12.0	14.0	Sd, m, gry br (10 YR 5/2) to 13.3',	SS			8	16	25/23	1.8	HNU=
		Sd, m-c, dk gry br (10 YR 4/2)								2.0-3.0
		from 13.3' to 14.0', some gv								
14.0	16.0	Sd, m, dk gry br (10 YR 4/2), some	SS			11	15	18/24	2.0	HNU=
		f gr w/ some v dk gry br (10 YR								sl neg
		3/2) lam								
16.0	18.0	Sd, m-f, gry br (10 YR 5/2), some	SS			35	81	52/92	2.0	HNU=
		f gv w/ some dk gry br (10 YR 4/2)								sl neg
		lam								

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Bloomington, Indiana 47401 (812) 336-0872

Site MIDCO I
Date 12-11-85
Logged by J. Gilles, R. Aten
Location

Boring No. B-30
Driller K. Hanlon
Elevation 600.85

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	6-12"	12-18"	Recvy. (ft)	Remarks
18.0	20.0	Sd, m-f, gry (10 YR 5/1), some	SS			7	7	9/11	1.8	HNU=0.0
		c sd & f gv, gry (10 YR 5/1), sm								
		wood frags at 19.2'								
20.0	22.0	Sd, m-f, gry (10 YR 5/1), some	SS			12	15	16/23	2.0	HNU=
		c sd & f gv throughout, c gv zone								2.0-3.0
		from 21.2' to 21.26' c sd layer								
		from 21.6' to 21.65', grades to f								
		sd w/ silt in bottom 0.2'								
22.0	24.0	Sd, m-f, gry (10 YR 5/1), some c	SS			15	17	21/32	2.0	HNU=
		sd & f gv throughout								1.0-2.0
24.0	26.0	Sc, m-f, gry (10 YR 5/1), some dk	SS			3	4	8/4	2.0	HNU=4-5
		sd & f gv throughout, some dk gry								
		(10 YR 4/1) in bottom 1.0'								
26.0	28.0	Sd, m-f, gry (10 YR 5/1), trace f	SS			6	6	10/11	2.0	HNU=1.0
		gv & c sd, into sd, c, v dk gry (10YR								
		3/1), gv from 27.4' to 27.5' Cl								
		silty, gry (10 YR 5/1) from 27.5' to								
		28.0', some gv & c sd								
28.0	30.0	Attempt Shelby tube (2.0' push)	ST						0	
		since no Shelby recovery split spoon								
		driven to confirm clay								
28.0	30.0	Cl, silty, gry (10 YR	SS			4	6	8/8	1.0	HNU=0
		5/1), some gv & c sd								
	30.0	TD								

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Site MIDCO I — Boring No. B-90
Date 12-17-85, 1-6-85 — Driller R. Mathes
Logged by B. Giles, J. Bassett — Elevation 601.07
Location

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	6-12"	12-18"	Recvy. (ft)	Remarks
0.0	29.0	Drove 6" steel casing to 29.0' on								
		12/14 and 12/16/85								
		Drove 4" steel casing to 30.0' on								
		12/17/85								
		See B-30 for boring log								
30.0	32.0	Took Shelby tube, allowed to swell	ST						0.0	
		for ~15 min. No recovery								
32.0	34.0	Cl, silty, gry (10 YR 5/1),	ST						1.8	HNU=0
		2" pebble								
35.0	37.0	Cl, silty, gry (10 YR 5/1), some	SS			2	2	3/2	1.7	HNU=0
		sm irregular pebble frags								
39.5	41.5	Cl, silty, gry (10 YR 5/1), some	SS			3	4	4/6	2.0	HNU=0
		sm irregular frags, some sd								
44.5	46.5	Cl, silty, gry (10 YR 5/1), sm				2	3	4/5	1.8	HNU=0
		irregular frags, some sd								
48.5	50.5	Cl, silty, gry br (10 YR 5/2),	SS			4	5	6/6	2.0	HNU=0
		sticky, plastic, rare pebbles								
53.5	55.5	Cl, silty, dk gry br (10 YR 4/2),	SS			4	7	9/10	1.1	HNU=0
		sticky, plastic, rare pebbles, mostly								
		grn sh								
58.5	60.5	Cl loam, pebbly dk gry br (10 YR	SS			11	23	43/5	1.2	HNU=0
		4/2), v firm (good loam till),								
		somewhat brittle								

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Site MIDCO I
Date 1/6 - 1/8/86
Logged by J. Bassett, B. Giles
Location

Boring No. B-90
Driller Ron & Fred Mathes
Elevation 601.07

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
63.5	65.5	Cl, silty, dk gry br (10 YR 4/2), soft, plastic, sticky, rare pebbles, sample like 53.5-55.5 above	SS			4	7	9/12	0.6	HNU=0
68.5	70.5	Cl, silty, dk gry br (10 YR 4/2), soft, plastic, sticky, sl pebbly, w/clasts up to 1 cm.	SS			5	6	8/9	1.5	HNU=0
73.5	75.5	Cl, silty, dk gry br (10YR4/2), soft, plastic, v sticky, sl pebbly	SS			3	5	6/6	2.0	HNU=0
78.5	80.5	Cl, silty, gry br (10YR5/2), soft, plastic, v sticky, v pebbly w/clasts up to 3/4" Ø, massive	SS			4	7	10/12		HNU=0
83.5	85.5	Cl, silty, dk gry br (10YR4/2), soft, plastic, sticky, pebbly	SS			7	10	14/18	0.5	HNU=0
93.5	95.5	Cl loam, pebbly, dk gry (10YR4/1) v hard, dense, till fabric, pebble clasts up to 5 mm, abund grn sh frags.	SS			20	44	87/130	0.7	HNU=0
	96.5	TD								

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Bloomington, Indiana 47401 (812) 336-0972

Site MIDCO I
Date 10/18/85
Logged by J. Bassett, B. Giles
Location

Boring No. C-30
Driller K. Schwartzkopf
Elevation 601.91

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
0.0	2.0	Sd, f-m, yel br (10YR 5/8), humic	SS			1	2	2/2	1.7	HNU=0.1
		in upper 0.3', dry, loose, numerous								
		rootlets								
2.0	4.0	Sd, f-m, yel br (10YR 5/8) in upper	SS			4	4	6/6	2.0	HNU=neg
		0.4' grading down to yel br (10YR								defl.
		5/4), moist at top, wet at base, loose to soft								
4.0	6.0	Sd, f-m, gry br (10YR 5/2), mottled	SS			1	2	3/6	1.0	HNU=0
		w/br in upper part, wet, running								sl odor
6.0	8.0	Sd, f-m, yel br (10YR 5/4) in upper	SS			2	4	4/6	2.0	HNU=neg
		0.8', v dk gry (10YR 3/1) in lower								sl odor,
		1.2'								sewage?
8.0	10.0	Sd, f-m, v dk gry (10YR 3/1), trace	SS			4	6	7/9	1.3	HNU=neg
		organic lam								sl odor
										sewage
10.0	12.0	Sd, f-m, dk gry (10YR 4/1), c sd lam	SS			2	2	8/10	2.0	HNU=neg
		in lower 0.5', rare								sl sewag odor
12.0	14.0	Sd, dk gry (10YR 4/1), wet, soft,	SS			8	12	16/17	1.9	HNU=1.4
		thin organic lam at 0.5' from base								sl sewag odor
14.0	16.0	Sd, f-m, v dk gry (10YR 3/1),	SS			12	16	20/22	2.0	HNU=7pp
		organic lam 0.4' from base including								petro o
		spruce? needles & whole plant frags								
16.0	18.0	Sd, f-m, v dk gry (10YR 3/1), wet,	SS			19	20	24/30	2.0	HNU=10-
		firm, sharp contact at 17.2' to sd,								ppm
		c w/f gv & granules, rounded, 17.2-								petro c
		17.8', sd, f, v dk gry, silty,								
		running, 17.8-18.0'								

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Site MIDCO I
Date 10/18/85
Logged by J. Basset, B. Giles
Location

Boring No. C-30
Driller K. Schwartzkopf
Elevation 601.91

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
18.0	20.0	Sd, m w/trace c sd, silty in upper	SS			18	29	40/50	2.0	HNU=10
		0.3', nongranular, wet, firm								strong petro odo
20.0	22.0	Sd, f-m, v dk gry (10YR 3/1),	SS			23	21	29/35	1.7	HNU=20+
		sugary, rare pebbles & granules, sd								strong
		seam w/mollusk frags 21.8' to 21.9',								petro od
		wet, firm								
22.0	24.0	Sd, m w/sm c sd, v dk gry (10YR 3/1)	SS			21	21	28/33	1.8	HNU=14
		rare granules, rare mollusk frags,								faint
		wet, firm								petro od
24.0	26.0	Sd, f-m, v dk gry (10YR 3/1) grading	SS			22	21	16/23	1.9	HNU=2
		to dk gry (10YR 4/1) in lower 0.8'								
26.0	28.0	Sd, f-m, v dk gry (10YR 3/1) 26.0 to	SS			10	6	5/7	2.0	HNU=13
		27.2', wet, sd, c granules 27.2' to								some
		27.5' w/sharp contact to cl, silty,								petro od
		gry (10YR 5/1), 27.5-28.0, v sticky,								
		lam, pebbly w/grn sh frags								
28.0	30.0	Cl, gry br (10YR 5/2), soft, v plastic, ST							1.1	HNU=0
		sticky, some Fe staining at bottom								
	30.0	TD								

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Site MIDCO I — Boring No. F-30
Date 1/16/86 — Driller R. Mathes
Logged by J. Gilles, R. Aten — Elevation 603.22
Location

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
0.0	2.0	Fill, sd, dk gry br (10YR4/2) grading to lt gry (10YR7/1) grading to v dk gry (10YR3/1) into lt yel br (10YR6/4) into gry br (10YR5/2), rocks throughout, frozen	SS			60	41	34/17	1.7	HNU=0.0
2.0	4.0	Sd, m, dk gry br (10YR4/2) grading into yel br (10YR5/4), organic seam 0.4' from top, sticks throughout, moist	SS			4	7	2/3	1.0	HNU=0
4.0	6.0	Sd, lt olive br (2.5Y5/4) top 0.3' into peat, blk & dk br (7.5YR3/2) w/roots & wood frags, into sd, m, v dk gry (10YR3/1) into gry br (10YR5/2)	SS			1	1	5/5	1.4	HNU=neg de=1
6.0	8.0	Sd, m, gry br (10YR5/2), wet	SS			3	2	3/4	1.2	HNU=0.0
8.0	10.0	Sd, m, gry br (10YR5/2), into m-c, dk gry (10YR4/1) bottom 0.15', wet	SS			6	7	8/7	1.5	HNU=0
10.0	12.0	Sd,, gry br (10YR5/2) & dk gry br (10YR4/2) mottled top 1.3', gv zone bottom 0.5' w/sd, lt br gry (10YR6/2), wet	SS			6	7	8/9	1.8	
12.0	14.0	Sd & gv, gry br (10YR5/2) top 1.4' into sd, gry br (10YR5/2), little gv grading to none in bottom 0.6', wet	SS			5	6	10/13	2.0	HNU=0.0
14.0	16.0	Sd, m-f, gry br (10YR5/2), gv seam 0.7'-0.8' from top, sd, f, gry br (2.5YR5/2) grading to c, gry br (2.5YR5/2) bottom 0.4', wet	SS			10	16	12/15	1.2	HNU=0.0

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Site MIDCO I — Boring No. F-30
Date 1/16/86 — Driller R. Mathes
Logged by J. Gilles, R. Aten — Elevation 603.22
Location

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
16.0	18.0	Sd, f, lt gry br (10YR6/2), wet	SS			4	7	10/16	0.8	HNU=0.0
18.0	20.0	Sd, f, gry br (10YR5/2), few rocks, moist	SS			15	24	30/36	1.2	HNU=0.0
20.0	22.0	Sd, f, gry br (10YR5/2), moist	SS			13	23	24/18		HNU=def
22.0	24.0	Sd, f-m, gry br (10YR5/2) grading to dk gry (10YR4/1), wet, occ pebble	SS			7	11	14/20		HNU=def
24.0	26.0	Sd, f-m, dk gry br (10YR4/2) top 0.3', gv zone 0.3'-0.85' to cl at 0.05' from bottom, cl 25.95'	SS			15	8	6/7	0.9	HNU=0.0
26.0	28.0	Cl, gry (10YR5/1) w/sd, dk yel br (10YR4/4) mottling, plastic, grn sh pebbles	ST						1.4	HNU=def
28.0	30.0	Cl, gry (10YR5/1) & dk yel br (10YR 4/4), sl mottling, soft, grn sh pebbles	ST						2.0	HNU=def
	30.0	TD								

ERM–North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	1 of 2	SB-2

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/07/93	03/07/93	Fox Drilling–G. Hammond	Diedrich D-50 w/HSA–4.25 inch I.D.	~8"	28'

CORE RECOVERY (FT/%)	CORE BOXES	SAMPLES	ELEV. TOP CASING	GROUND ELEV.	DEPTH/ELEV. GROUND WATER	DEPTH/ELEV. TOP OF ROCK
/		0			8' bgs	NOT ENCOUNTERED

SAMPLE DEVICE	DRILL CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY
2 feet x 2 Inch Std. Split Spoon		Charles Dyer/ERM–N. England

SAMPLES/R.CORE				CONTAMINANT SCREENING			LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
Lab Sample # Time	Recovery (feet)	Length (feet)	Blow Count RQD (%)	Sample Scan (Vppm)	Monitox (Vppm)	Observations						
A/1042	2.0	2.0	7 15 15 15	50.0	0						0.0–0.5': CLAY: (Fill)–light yellowish brown (10YR 6/4).	Added 10 gallons of water: 1–2 ppm in breathing zone.
											0.5–2.0': GRAVEL: (Fill)–dark gray (10YR 4/1), some fine sand, poorly sorted, solvent odor.	
B/1054	1.0	2.0	7 11 15 23	70.0	0						2.0–27.5': SAND 2.0–4.0': dark gray (10YR 4/1), fine grained, homogeneous, strong solvent odor.	Upgrade to Level C at 1100.
C/1100	1.5	2.0	20 7 10 11	9.0	0						4.0–5.5': As above, brown (10YR 4/2).	
								5			5.5–6.0': As above, dark gray (10YR 4/1), well sorted.	
D/1118	1.0	2.0	2 3 4 5	5.0	0						6.0–6.0': As above, wet.	
E/1120	1.6	2.0	3 4 4 5	3.0	0						6.0–10.3': As above, fine grained with abundant shell fragments, trace of gravel, subangular to 1 cm.	
								10			10.3–11.5': As above, fine to coarse grained, poorly sorted, trace of fine gravel, abundant small shell fragments.	
F/1128	2.0	2.0	3 5 8 15	1.0	0						11.5–12.0': As above, fine grained, homogeneous, well sorted.	
G/1134	2.0	2.0	5 9 18 23	15.0	0						12.0–14.0': As above.	
H/1138	2.0	2.0	8 17 27 34	1.0	0						14.0–16.0': As above, gray (10YR 5/1), trace of fine gravel, subangular to 1 cm.	2 ppm down augers; 0 ppm in breathing zone.
								15				

ERM-North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	2 of 2	SB-2

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/07/93	03/07/93	Fox Drilling-G. Hammond	Diedrich D-50 w/HSA-4.25 inch I.D.	~8"	28'

Continued

SAMPLES/R.CORE: Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count/ ROD (%)	CONTAMINANT SCREENING: Sample Scan (Vppm)	Monotox (Vppm)	Observations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
H/1138	2.0	2.0	9 17 27 34	1.0	0			15			
I/1144	2.0	2.0	12 17 19 34	1.0	0		-16.5			16.0-17.0': As above, medium to coarse grained with 30% fine gravel, poorly graded, subangular to subrounded gravel up to 2 cm diameter.	1144 downgrade to Level D; 0 ppm in breathing zone.
							-17			17.0-18.0': As above, fine grained, well sorted, few fine shell fragments, trace fine gravel, subangular to 0.5 cm.	
J/1151	2.0	2.0	5 8 13 18	30.0	0					18.0-20.0': As above.	
K/1157	2.0	2.0	12 21 33 42	0.0	0			20		20.0-22.0': As above, homogeneous, uniform.	Replaced HNu. Faulty readings on last spoon.
L/1203	1.7	2.0	8 14 27 28	0.0	0					22.0-24.0': As above, some fine shale lamination, trace very fine shell fragments.	
M/1212	2.0	2.0	7 12 17 18	0.0	0					24.0-26.0': As above.	
N/1218	2.0	2.0	12 7 10 10	0.0	0			25		26.0-26.5': As above.	
							-26.5			26.5-27.5': As above, dark gray (10YR 4/1), with fine gravel, medium to coarse grained, subangular gravel to 1 cm diameter.	
							-27.5			27.5-28.0': CLAY: gray (10YR 5/1), massive, moderately soft.	
							-28			End of boring at 28 feet.	
								30			

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	1 of 2	SB-3

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/02/93	03/02/93	Fox Drilling–G. Hammond	Mobil B-61 w/HSA–4.25 inch I.D.	~8"	28'

CORE RECOVERY (FT/%)	CORE BOXES	SAMPLES	ELEV. TOP CASING	GROUND ELEV.	DEPTH/ELEV. GROUND WATER	DEPTH/ELEV. TOP OF ROCK
/		0			▼ 4.5' bgs	NOT ENCOUNTERED

SAMPLE DEVICE	DRILL CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY
2 feet x 2 inch Std. Split Spoon		Lance Little/ERM–No. Central

SAMPLES/R.CORE				CONTAMINANT SCREENING						DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
Lab Sample # Time	Recovery (feet)	Length (feet)	Blow Count ROD (%)	Sample Scan (Vppm)	Monotorx (Vppm)	Observations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SOURCE	
A/1036	2.0	2.0	10 7 7 10	0.0	0						0.0–1.1': SILTY CLAY: Light yellow brown (10YR 6/4), hard.
											1.1–1.6': SAND: Gray brown to dark gray brown, fine
B/1038	1.5	2.0	3 6 7 7	0.0	0						1.6–2.0': As above, yellow (10YR 7/8), loose, fine to medium.
											2.0–4.0': As above, brown yellow (10YR 6/6 to 6/8), damp.
C/1044	1.25	2.0	3 6 7 7	0.0	0						4.0–6.0': As above, sharp color change from 10YR brown yellow to 5G 4/1 dark green gray, wet.
								5			Water at 4.5 feet.
D/1049	1.25	2.0	2 2 3 4	0.2	0						6.0–8.0': As above, wet.
E/1053		2.0	1 1 2 2	0.0	0						8.0–10.0': As above, wet.
F/1108	2.0	2.0	2 6 7 8	0.0	0			10			10.0–12.0': As above, homogeneous gray (10YR 5/1), 1.5-inch diameter shale pebbleat 11.5 feet.
G/1118	2.0	2.0	4 5 11 15	0.0	0						12.0–14.0': As above, some layering with beds grading from primarily fine to primarily medium.
H/1125	2.0	2.0	3 7 21 24	0.0	0						14.0–16.0': As above, at 15.5 feet one 1.5-inch diameter limestone pebble, 1-inch thick layer of very coarse sand.
								15			

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	2 of 2	SB-3

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/02/93	03/02/93	Fox Drilling-G. Hammond	Mobil B-61 w/HSA-4.25 inch I.D.	~8"	28'

Continued

SAMPLES/R.CORE: Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count/ ROD (%)	CONTAMINANT SCREENING: Sample Scans (Vppm)	Monotors (Vppm)	Observations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	MARKER	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
H/1125	2.0	2.0	3 7 21 24	0.0	0			15				
I/1130	2.0	2.0	6 11 21 32	0.0	0						16.0-18.0': As above, gray brown poorly-sorted sand, mostly fine to medium with interbedded coarse sand, shale fragments to 1-inch diameter.	
J/1137	L75	2.0	9 11 23 25	0.0	0						18.0-21.0': As above, gray brown (10YR 5/2) fine sand with fine gravel.	
K/1145	2.0	2.0	5 15 28 29	0.0	0			20			20.0-21.0': As above.	
L/1254	2.0	2.0	8 11 29 50	0.0	0						21.0-22.0': As above, fining downwards, mostly fine sand at 22 feet.	
M/1201	2.0	2.0	11 11 21 24	0.0	0						22.0-23.0': As above.	
											23.0-24.0': As above, fine to very fine brown gray sand, dense.	
											24.0-26.0': As above.	
								25				
N/1207	2.0	2.0	10 17 11 7	0.0	0		-26				26.0-27.0': As above, two inches of coarse sand and fine gravel at 26 feet.	
							-26.5					
							-27				27.0-27.5': As above, bedded sands, fine to very coarse in 4 to 6-inch layers.	
							-27.5					
							-28				27.5-28.0': SILTY CLAY: Brown gray	
											End of boring at 28 feet. No free product observed.	
								30				

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	1 of 2	SB-4

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/10/93	03/10/93	Fox Drilling–T. Dykas	Diedrich D-50 ATV w/HSA–4.25 inch I.D.	~8"	30'

CORE RECOVERY (FT/%)	CORE BOXES	SAMPLES	ELEV. TOP CASING	GROUND ELEV.	DEPTH/ELEV. GROUND WATER	DEPTH/ELEV. TOP OF ROCK
/		0			▽ 4.0' bgs	NOT ENCOUNTERED

SAMPLE DEVICE	DRILL CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY
2 feet x 2 inch Std. Split Spoon		Harry Ricketts/ERM-No. Central

SAMPLES/R.CORE				CONTAMINANT SCREENING						
Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count / ROD (%)	Sample Boom# (Vppm)	Monitox (Vppm)	Observations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
A/1010	1.0	2.0	2 4 6 7	0.0	0					0.0–1.0': CLAY; very dark grayish brown (10YR 3/2), blocky, plastic roots, moist.	
							-1-			1.0–27.0: SAND; yellowish brown (10YR 5/8), fine grained, well sorted.	
B/1012	1.5	2.0	7 6 5 6	0.0	0					2.0–4.0': As above.	
										4.0–5.5': As above, homogeneous, wet.	Water at 4.0 feet.
C/1015	2.0	2.0	7 8 8 9	0.0	0			5		5.5–6.0': As above, very dark grayish brown (10YR 3/1).	
										6.0–8.0': As above.	
D/1020	2.0	2.0	8 9 9 11	0.0 - -	0					8.0–9.5': As above.	
E/1042	2.0	2.0	3 5 6 13	0.0	0					9.5–10.0': As above, medium to fine-grained sand, moderately well sorted, trace scattered small pebbles, abundant shell fragments.	
F/1055	2.0	2.0	6 8 10 10	0.0	0			10		10.0–12.0': As above.	
										12.0–14.0': As above, moderately sorted.	
G/1108	2.0	2.0	8 8 9 11	0.0	0					14.0–15.5': As above, fine-grained sand with subrounded pebbles.	Two feet of heave cleared by rotating HSA.
H/1300	2.0	2.0	8 14 21 29	0.0	0			15		15.5–16.0': Color as above, poorly sorted medium and fine-grained sand with subrounded small pebbles.	
I/1306	2.0	2.0	9 13 17 19	0.0	0					16.0–18.0': As above.	
										18.0–19.5': As above, some gravel.	
J/1318	2.0	2.0	9 13 17 19	0.0	0					19.5–20.0': As above, thinly laminated.	
								20			

ERM-North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	2 of 2	SB-4

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/10/93	03/10/93	Fox Drilling-T. Dykas	Diedrich D-50 ATV w/HSA-4.25 inch I.D.	~8"	30'

Continued

SAMPLES/R.CORE: Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count / ROD (%)	CONTAMINANT SCREENING: Sample Scan (Vppm)	Manotorn (Vppm)	Obser-vations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
K/1320	2.0	2.0	4 9 15 23	0.0	0			20			20.0-20.5': As above, peat laminations. 20.5-22.0': Color as above, fine grained to very fine-grained sand, thinly laminated, well sorted, scattered small pebbles throughout.	
L/1320	2.0	2.0	9 15 15 38	0.0	0						22.0-24.0': As above.	
M/1336	2.0	2.0	14 17 28 24	0.0	0			26			24.0-27.0': As above, no scattered pebbles.	
N/1345	2.0	2.0	3 7 44 20	0.0	0		-27				27.0-28.0': SANDY CLAY: color as above, gravelly, dense, non-plastic, moist, possible small mudstone clast at 27.9 feet.	
O/1350	2.0	2.0	1 2 4 4	0.0	0		-28				28.0-29.2': SAND: Very dark gray (10YR 3/1), fine grained, trace scattered small pebbles.	
							-29.2				29.2-30.0': CLAY: dark gray (10YR 4/1), massive, very plastic, trace scattered small pebbles, moist.	
							-30	30			End of boring at 30 feet.	
								35				
								40				

ERM-North Central, Inc.

Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	1 of 2	SB-5

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/06/93	03/06/93	Fox Drilling-T. Dykas	Mobil B-61 w/HSA-3.75 inch I.D.	~8"	28'

CORE RECOVERY (FT/%)	CORE BOXES	SAMPLES	ELEV.TOP CASING	GROUND ELEV.	DEPTH/ELEV. GROUND WATER	DEPTH/ELEV. TOP OF ROCK
/		0			▽ 4.0' bgs	NOT ENCOUNTERED

SAMPLE DEVICE	DRILL CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY
2 feet x 2 inch Std. Split Spoon		Harry Ricketts/ERM-No. Central

SAMPLES/R.CORE				CONTAMINANT SCREENING			LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
Lab Sample # Time	Recovery (feet)	Length (feet)	Blow Count/ RQD (%)	Sample Scan# (Vppm)	Monotox# (Vppm)	Obser-vations						
A/0852	1.0	2.0	6 9 8 6	0.0	0						0.0-4.0': FILL: Black (10YR 2/1) gravel, slag, wood, and clay, moist.	
B/0901	1.0	2.0	8 9 6 4	0.0	0						2.0-4.0': As above.	
C/0912	0.5	2.0	5 3 2 2	0.0	0			4			4.0-27.5: SAND, 4.0-5.5': As above, dark yellowish brown (10YR 4/4) sandy loam, very fine-grained sand, massive, fat, wet.	Water at 4.0 feet.
D/0919	0.5	2.0	2 2 5 5	0.0	0	oil sheen		5			5.5-8.0': As above, black clay in end of split spoon. 6.0-8.0': As above, black (10YR 2/1) loam, massive, non-plastic, abundant roots, oil sheen present.	
E/0922	1.0	2.0	6 8 10 7	0.0	0	odor					8.0-10.0' As above, sandy loam with very fine-grained sand, well sorted, homogeneous, sulphur-like odor, wet.	No heave, no slough.
F/0938	1.5	2.0	4 5 7 10	0.0	0	odor		10			10.0-12.0': As above, wood fragments, possibly from uphole, sulphur- like odor.	
G/0940	1.5	2.0	2 6 9 16	0.0	0	odor					12.0-14.0': As above, scattered shell fragments, sulphur-like odor.	
H/0947	2.0	2.0	9 21 23 8	0.0	0	odor		15			14.0-15.5': As above.	

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GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	2 of 2	SB-5

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/06/03	03/06/03	Fox Drilling-T. Dykas	Mobil B-61 w/HSA-3.75 inch I.D.	~8"	28'

Continued

SAMPLES/RCORE: Lab Sample # Time	Recovery (feet)	Length (feet)	Blow Count RQD (%)	CONTAMINANT SCREENING: Sample Scan (Vppm)	Monitorx (Vppm)	Observations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
H/0947	2.0	2.0	9 21 23 8	0.0	0	odor		15			16.5-18.0': Color as above, subrounded medium to fine-grained sand, moderately sorted, with large pebbles, sulphur-like odor.	
I/0952	2.0	2.0	3 7 10 20	0.0	0	odor					18.0-18.5': As above.	2 Vppm in hole.
J/0958	2.0	2.0	6 11 20 27	1.0	0	slight odor					18.5-18.0': As above, sand alternating with gravelly sand, coarse to fine-grained sand, poorly sorted.	
K/1006	2.0	2.0	2 5 11 25	1.0	0	slight methane odor		20			18.0-19.0': As above, dark gray (10YR 4/1) sand, fine to medium with abundant shell fragments.	4 Vppm in hole.
L/1010	2.0	2.0	3 9 11 20	1.0	0	very slight methane odor					19.0-20.0': As above, fine-grained, homogeneous, faint trash-like odor.	
M/1016	2.0	2.0	4 6 11 15	0.5	0	very slight methane odor					20.0-20.5': As above.	9 Vppm in hole. No heave, no slough.
N/1021	2.0	2.0	3 5 6 8	0.0	0	no odor					20.5-22.0': As above, very well sorted, trace scattered small shale fragments.	
											22.0-24.0': As above.	Adding no water to hole.
								25			24.0-26.0': As above.	
											26.0-27.5': As above.	
							-27.5					Clay at 27.5 feet.
							-27.8				27.5-27.8': CLAY: gray (10YR 5/1), massive, plastic, scattered iron oxide mottling, moist.	
				0.0	0		-28				27.8-28.0': SANDY CLAY: gray (10YR 5/1), gravelly, dense, non-plastic, moist.	
								30			End of boring at 28 feet.	

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	1 of 2	SB-8

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/04/93	03/04/93	Fox Drilling-E. Hammond	Mobil B-61 w/HSA-4.25 inch I.D.	~8"	28'

CORE RECOVERY (FT/%)	CORE BOXES	SAMPLES	ELEV. TOP CASING	GROUND ELEV.	DEPTH/ELEV. GROUND WATER	DEPTH/ELEV. TOP OF ROCK
/		0			▼ 4.0' bgs	NOT ENCOUNTERED

SAMPLE DEVICE	DRILL CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY
2 feet x 2 inch Std. Split Spoon		Lance Little/ERM-No. Central

SAMPLES/R.CORE				CONTAMINANT SCREENING						
Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count/ RQD (%)	Sample Scann (Vppm)	Moniotox (Vppm)	Obser-vations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SAMPLE
A/0845	1.0	2.0	2 5 6 7	0.0	0					
B/0850	1.25	2.0	7 8 8 13	0.0	0					
C/0900	1.0	2.0	4 12 12 10	0.0	0					
D/0908	1.16	2.0	3 5 5 5	0.0	0					
E/0911	0.85	2.0	3 3 5 7	0.0	0					
F/0917	1.8	2.0	3 5 6 10	0.0	0					
G/0923	2.0	2.0	3 8 12 22	0.0	0					
H/0931	2.0	2.0	11 8 8 13	0.0	0					

DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
0.0-2.6': SAND: reddish brown to reddish yellow fine sand, one 2-inch diameter concrete fragment, dry.	
2.0-2.6': As above.	
2.6-3.0': Black cinders at 2.6 feet.	
3.0-4.0': As above, light brown gray (2.5Y 6/2) sand with black staining in upper portion.	
4.0-6.0': As above, well sorted fine silica sand, wet.	Water at 4.0 feet.
6.0-8.0': As above.	
8.0-10.0': As above.	
10.0-11.0': As above.	
11.0-12.0': As above, two-inch layer of medium sand at 11 feet.	
12.0-13.5': As above.	
13.5-14.0': As above, one-half inch layer of medium sand at 13.6 feet.	
14.0-15.75': As above.	

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	2 of 2	SB-B

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitor (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/04/93	03/04/93	Fox Drilling-G. Hammond	Mobil B-61 w/HSA-4.25 inch I.D.	~8"	28'

Continued

SAMPLES/RCORE				CONTAMINANT SCREENING			LAYER ELEV./DEPTH	DEPTH	GRAPHIC LOG	SYMBOL	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
Lab Sample # Time	Recovery (feet)	Length (feet)	Blow Count ROD (%)	Sample Scan (Vppm)	Monitor (Vppm)	Observations						
H/0931	2.0	2.0	11 8 8 13	0.0	0			15				
I/0941	2.0	2.0	9 11 32 36	0.0	0		-16				15.75-16.0': As above, two 1/2-inch thick slightly clayey layers at 15.75 feet, stained black. 16.0-19.0': SAND AND GRAVEL: layered gray green (5G 4/2) sand and fine gravel, beds two to six inches thick grading from fine sand to fine gravel, coarsening to medium gravel (1" diameter) at 19 feet.	
J/0949	2.0	2.0	8 11 20 34	0.0	0		-19				18.0-19.0': As above. 19.0-27.5': SAND: gray green (5G 4/2) fine sand, well sorted.	
K/0958	2.0	2.0	11 15 28 29	0.0	0			20			20.0-22.0': As above.	
L/1002	L25	2.0	5 15 18 19	0.0	0						22.0-24.0': As above.	
M/1009	2.0	2.0	8 18 19 21	0.0	0						24.0-26.0': As above, becoming slightly silty.	
N/1015	2.0	2.0	8 20 18 7	0.0	0			25			26.0-27.5': As above.	
							-27.5 -27.7 -28				27.5-27.75: GRAVEL: three-inch thick layer of coarse gravel to 1.5-inch diameter. 27.75-28.0': CLAY: brownish gray silty clay. End of boring at 28.0 feet.	
								30				

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	1 of 2	SB-P

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/11/93	03/11/-93	Fox Drilling–G. Hammond	Fox–Diedrich D-50 w/HSA–4.25 inch I.D.	~8"	28.0'

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	ELEV. TOP CASING	GROUND ELEV.	DEPTH/ELEV. GROUND WATER	DEPTH/ELEV. TOP OF ROCK
/		0			▽ 2.0' bgs	NOT ENCOUNTERED

SAMPLE DEVICE	DRILL CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY
2 feet x 2 inch Std. Split Spoon		Harry Ricketts/ERM–No. Central

SAMPLES/R.CORE				CONTAMINANT SCREENING			LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count / ROD (%)	Sample Steam (Vppm)	Monotox (Vppm)	Observations						
A/0924	1.0	2.0	4 6 6 8	0							0.0–0.5': FILL: very dark brown (10YR 2/2) loamy clay topsoil and fill.	
											0.5–25.1': SAND: black (10YR 2/1), fine to medium grained, moderately sorted, homogeneous, moist.	
B/0928	2.0	2.0	7 7 7 7	0							2.0–4.0': As above, no structures visible, wet.	
C/0930	2.0	2.0	6 8 10 15	0							4.0–5.5': As above.	Water with drill returns has oil-like sheen.
								5				
D/0933	2.0	2.0	10 20 29 35	0							5.5–6.0': SANDY LOAM: very dark gray (10YR 3/1), fine-grained sand, moist, thinly laminated with silt.	
											6.0–13.8': SAND: black (10YR 2/1).	
											7.0–8.0': As above, dark gray (10YR 4/1).	
E/0952	2.0	2.0	6 11 15 17	0							8.0–9.0': As above, coarse to fine grained, poorly sorted.	
											9.0–10.0': As above, fine to very fine grained, well sorted, thin laminations.	
F/1002	2.0	2.0	7 9 12 14	0				10			10.0–12.0': As above, fine to medium grained, moderately sorted, scattered very small pebbles, texture fines downward.	
G/1010	2.0	2.0	7 9 9 11	0							12.0–13.8': As above, fine to very fine grained, well sorted, thin laminations.	
H/1020	2.0	2.0	12 25 35 34	0							13.8–14.0': SANDY GRAVEL: small gravel and coarse sand, subangular to subrounded pebbles.	
								15			14.0–14.8': SAND: dark gray (10YR 4/1).	

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	2 of 2	SB-P

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/11/93	03/11/-93	Fox Drilling–G. Hammond	Fox-Diedrich D-50 w/HSA-4.25 inch I.D.	~8"	28.0'

Continued

SAMPLES/R.CORE: Lab Sample # Time	Recovery (feet)	Length (feet)	Blow Count N(0) (%)	CONTAMINANT SCREENING: Sample Scan (Vppm)	Monitox (Vppm)	Observations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
H/1020	2.0	2.0	12 26 35 34	0				15			fine to very fine grained, well sorted.	
							-15.5				14.8–15.5': SANDY GRAVEL.	
I/1025	2.0	2.0	10 14 28 25	0							15.5–18.2': SAND, dark gray (10YR 4/1), fine to coarse grained, abundant scattered small pebbles.	
											18.0–17.3': As above.	
											17.3–18.0': As above, rounded to subrounded gravel, no laminations.	
J/1034	2.0	2.0	13 15 17 19	0							18.0–19.2': As above.	
							-19.2					
							-19.5				19.2–19.5': GRAVEL: large rounded to subrounded gravel.	
K/1041	2.0	2.0	11 15 17 20	0				20			19.5–21.0': SAND: dark gray (10YR 4/1), coarse to fine grained, coarsening downward, poorly sorted, large gravel from 21 to 21.3'.	
							-21					
							-21.3				21.0–21.3': GRAVEL: large, poorly sorted.	
											21.3–22.0': SAND: dark gray (10YR 4/1), very fine grained, well sorted, thinly laminated.	
L/1050	2.0	2.0	6 11 10 8	0			-22				22.0–23.3': GRAVEL: dark gray (10YR 4/1), large, poorly sorted.	
							-23.3				23.3–25.1': SAND: very dark gray (10YR 3/1), fine to very fine grained, well sorted, thinly laminated.	
M/1058	2.0	2.0	7 8 8 8	0							24.0–25.0': As above, dark gray to very dark gray (10YR 4/1 to 10YR 3/1), abundant scattered small pebbles. Large gravel at 25 to 25.1 feet.	
							-25 -25.1	25			25.1–26.0': CLAY: very dark grayish brown (10YR 3/2), massive, very plastic, slightly sticky, trace scattered small pebbles, moist.	
							-26				End of boring at 26 feet.	
								30				

ERM-North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	1 of 2	SB-R

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
NIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/06/93	03/07/93	Fox Drilling-T. Dykas	ATV D-50 w/HSA-4.25 inch I.D.	~8"	28'

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	ELEV. TOP CASING	GROUND ELEV.	DEPTH/ELEV. GROUND WATER	DEPTH/ELEV. TOP OF ROCK
/		0			▼ 8' bgs	NOT ENCOUNTERED

SAMPLE DEVICE	DRILL CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY
2 feet x 2 inch Std. Split Spoon		D.L. Ritter/ERM-No. Central

SAMPLES/RCORE				CONTAMINANT SCREENING			LAYER ELEV./DEPTH	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count RQD (%)	Sample Scan (Vppm)	Monitox (Vppm)	Obser-vations						
A/1440	1.0	2.0	1 1 2 5	0.0	0						0.0-2.0': CLAYEY SAND: (FILL)-very dark gray (5YR 3/1) mottled with yellowish red (5YR 6/6), moist, soft to very soft.	
B/1442	1.0	2.0	11 15 13 12	0.0	0						2.0-7.5': SAND: (FILL)-very dark gray (5YR 3/1), fine grained, moist, medium dense.	
C/1443	2.0	2.0	7 6 5 5	0.0	0			5			4.0-6.0': As above, fine grained to very fine grained, trace of silt, wood fragments, moist, well sorted, loose.	
D/1446	2.0	2.0	7 11 15 17	0.0	0						6.0-7.5': LOAMY SAND: very dark gray (5YR 3/1).	
E/1503	2.0	2.0	8 9 9 13	3.5	0						7.5-28.5': SAND: gray (5YR 5/1), very fine grained, trace of silt, well sorted, medium dense. 8.0-10.0': As above, fine to very fine grained, loose, black mottling, saturated.	Saturated. 4 ppm HNu reading in open auger.
F/1511	2.0	2.0	4 8 18 24	5.2	0			10			10.0-12.0': As above.	3 ppm in breathing zone. Upgrade to Level C.
G/1519	2.0	2.0	8 18 11 8	5.2	0						12.0-14.0': As above.	3 ppm in augers; 5 ppm in soil cuttings.
H/1810	2.0	2.0	10 21 26 40	5.0	0			15			14.0-15.5': As above, dark gray brown (10YR 4/2), medium dense to dense, some gravel, poorly sorted, some yellow FeO2 staining at 15 feet.	

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Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT/TASK	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
2602	92127EM	2 of 2	SB-R

SITE	COORDINATES	CONTAMINANT SCREENING NOTES
MIDCO I		Model 101 HNu w/11.7 eV lamp/Monitox (HCN)

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	DEPTH (FT)
03/06/93	03/07/93	Fox Drilling-T. Dykas	ATV D-50 w/HSA-4.25 inch I.D.	~8"	28'

Continued

SAMPLES/R.CORE: Lab Sample # / Time	Recovery (feet)	Length (feet)	Blow Count/ROD (%)	CONTAMINANT SCREENING: Sample Scan (Vppm)	Monitorx (Vppm)	Observations	LAYER ELEV. / DEPTH	DEPTH	GRAPHIC LOG	WELL	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
H/1810	2.0	2.0	10 21 28 40	6.0	0			15			15.5-17.0': As above, very fine to fine grained, well sorted.	
I/1820	2.0	2.0	5 27 50/5"	4.0	0						17.0-18.0': As above, grayish brown (10YR 5/2), trace of gravel, gastropods.	
J/1826	2.0	2.0	15 22 30 45	2.0	0						18.0-20.0': As above, trace wood fragments	
K/1830	2.0	2.0	10 18 23 24	1.8	0			20			20.0-22.0': As above.	
L/0840	2.0	2.0	8 14 22 29	0.0	0						22.0-24.0': As above, gray (5YR 8/1), shell fragments.	0840 downgrade to Level D; 0 ppm in breathing zone.
M/0855	1.8	2.0	8 12 12 8	0.0	0			25			24.0-26.0': As above, gray (5YR 8/1), trace of fine gravel, subangular to 1 cm, laminations at 24.5' (0.4 cm).	
N/0913	1.5	2.0	5 7 8 9	0.0	0						26.0-26.5': No recovery. Resample interval (clay present in shoe).	
							-26.5				26.5-28.0': CLAY: gray (5YR 6/1) medium stiff to stiff, some gravel, angular, poorly sorted, FeO2 staining at 27.0 feet.	
							-28				End of boring at 28 feet. Stratigraphic boring grouted with bentonite slurry.	
								30				

28.5 >

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Site MIDCO I
Date 10/14/85, 10/18/85, 10/21/85
Logged by B. Giles, J. Gilles, R. Aten
Location

Boring No. E-200
Driller R. Griswald
Elevation 609.08

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
0.0	28.5	Sd, see boring log E-30 on 10/14/85 augered 15', started driving 6" surface steel casing on 10/15/85 steel casing advanced to 18' On 10-16-85 steel casing advanced to 24' On 10-17-85 steel casing advanced to 29.2', set into clay On 10/18/85 drove 4" steel casing to 33', sampled at 33'								
33.0	35.0	Recovery was all sd heave sd, m-c, gry 1.0' of heave recovery, 0.05' cl in split spoon bit	SS			14	9	10/11	1.0	
38.0	40.0	Cl, somewhat silty, gry (10YR 5/1) grn sh frags (granules)	ST						2.0	
43.0	45.0	Cl, silty, gry (10YR 5/1), grn sh frags, some gv, trace f sd	SS			4	6	8/11	1.8	
48.5	50.0	Cl, silty, gry (10YR 5/1), f sd & gv, gry cl layer at 38.3' - 38.4' (may be wash from above), sandier cl in lower 0.3'	SS			4	5	6	2.0	HNU=sl r
53.0	55.0	Cl, silty, gry (10YR 5/1), f gv, sh frags, 0.3' of gvy wash on top of recovery	SS			4	6	9/10	1.2	HNU=0.0
58.0	60.0	Cl, silty, gry (10YR 5/1), some gv, trace sd, 0.1' gvy wash	SS			6	9	9/12	1.0	HNU=0.0

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Site MIDCO I **Boring No.** E-200
Date 10/21-23/85 **Driller** R. Griswald
Logged by B. Giles, J. Gilles, R. Aten **Elevation** 609.08
Location

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
63.0	65.0	Cl, silty, gry (10YR5/1), trace sd & gv -	ST						2.0	
					not adequate recovery					
65.0	67.0	Cl, silty, gry (10YR5/1), trace sd, some gv, wash in top of Shelby tube	ST						2.0	
68.0	70.0	Silt, cly, gry (10YR5/1), some gv, trace sd, lower 0.2' is gv zone w/silt & cl	SS			9	20	24/33	1.7	HNU=0.0
73.0	75.0	Silt, cly, gry (10YR5/1), some gv, trace sd	SS			16	21	20/24	0.7	HNU=0.0
78.0	80.0	Cl, silty, gry (10YR5/1), some gv, trace sd, grn sh frags	SS			5	5	7/9	1.2	HNU=0.0
83.0	85.0	Cl, silty, gry (10YR5/1), some gv, trace sd, grn sh frags	SS			5	5	7/13	1.0	HNU=0.1
88.0	90.0	Cl, silty, gry (10YR5/1), some gv, more gv in upper 0.5', trace sd, sh frags	SS			5	5	9/13	1.9	HNU=0.0
93.0	95.0	Cl, silty, gry (10YR5/1), some gv, trace sd, sh frags upper 0.9', silt, cly, dk gry (10YR3.5/1), some gv, grn gry (5GY5/1) inclusions lower 0.3'	SS			7	18	24/45	1.2	HNU=0
103.0	105.0	No recovery	SS			11	19	34/37	0.0	
105.0	107.0	Cl, silty, gry to dk gry (10YR5/1), gvy, some sd	SS			34	34	41/47	0.8	HNU=0.0
108.0	110.0	Silt, cly, gry, gry (10YR4.5/1), some sd	SS			21	47	124/182	1.5	HNU=0.0

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Site MIDCO I — Boring No. E-200
Date 10/23-25/85 — Driller R. Griswald
Logged by B. Giles, J. Gilles, R. Aten — Elevation 609.08
Location

Depth From	Depth To	Description	Sample Type	Spl. No.	Depth	Blow Count 0-6"	Blow Count 6-12"	Blow Count 12-18"	Recvy. (ft)	Remarks
113.0	115.0	Cl, silty, gry (10YR5/1), some gv, trace sd				35	57	72/92	1.4	HNU=0.0
118.0	120.0	Cl, v silty, gry to dk gry (10YR 4.5/1), some gv, trace sd	SS			25	50	70/85	0.5	HNU=0.0
123.0	125.0	Cl, v silty, gry to dk gry (10YR4.5 /1), some gv, trace sd, hard	SS			28	61	59/115	1.5	HNU=0.0
128.0	130.0	Cl, v silty, gry to dk gry (10YR4.5 /1), some gv, trace sd, ls fraqs, v hard, attempted to take Shelby tube at 128', no recovery	attempted ST at 128.0' - too hard, no recovery							HNU=S1
133.0	135.0	Cl, silty, gry to dk gry (10YR4.5 /1), some gv, trace sd, not as hard as previous sample	SS			27	27	40/62	0.7	
138.0	140.0	Cl, gvv, sdy, gry (10YR5/1), some silt, hard	SS			40	68	70/68	1.4	HNU=0.0
141.0	152.0	Dolomite								
	152.0	TD								

ELEV. (ft)	DEPTH (ft)	SAMPLES NO.	SAMPLES BLOWS PER 6"	GRAPHIC LOG	DESCRIPTION	WATER CONTENT (%)	DRY DENSITY (pcf)	COHESION (psf)	STANDARD PENETRATION RESISTANCE Blows per Foot 10 20 30 40
0					Fine to Medium SAND.				
	5								
	10								
	15								
	20								
-22					22.0 Dense Brown SILT with Some Fine Sand.				
	25								
-29					29.0 Brown Plastic CLAY.				
	30								
-32					**Boring terminated at 32 feet.**				
	35								
	40								

Date Drilling Started: 1 Oct 03 **Ended:** 1 Oct 03

Drilling Contractor: Contract Dewatering Services, Inc. (CDS)

Driller: DN **Inspector:**

Notes: *1. Boring located at center of south side.*
2. HNu Readings 1-2 ppm by CDS
HCN Readings 0 ppm by CDS
3. 6-inch solid flight augers used for drilling
4. Borehole backfilled with auger cuttings

Contract Dewatering Services, Inc.

Midco I Slurry Wall

Gary, Indiana

LOG OF TEST BORING NO. CDB-1

ELEV. (ft)	DEPTH (ft)	SAMPLES NO.	SAMPLES BLOWS PER 6"	GRAPHIC LOG	DESCRIPTION	WATER CONTENT (%)	DRY DENSITY (pcf)	COHESION (psf)	STANDARD PENETRATION RESISTANCE Blows per Foot 10 20 30 40
0					Medium SAND.				
	5								
	10								
	15								
	20								
-25	25				25.0				
					Fine Brown SAND.				
-27					27.0				
					SILTY SAND.				
-29					29.0				
	30				Brown SILTY CLAY.				
-32					**Boring terminated at 32 feet.**				
	35								
	40								

Date Drilling Started: 1 Oct 03 **Ended:** 1 Oct 03

Drilling Contractor: Contract Dewatering Services, Inc.

Driller: DN **Inspector:** _____

Notes:
1. *Boring located at center of west side.*
2. *HNu Readings 6-7 ppm by CDS*
   HCN Readings 0 ppm by CDS
3. *6-inch solid flight augers used for drilling*
4. *Borehole backfilled with auger cuttings*

Contract Dewatering Services, Inc.

Midco I Slurry Wall

Gary, Indiana

LOG OF TEST BORING NO. CDB-2

ELEV. (ft)	DEPTH (ft)	SAMPLES NO.	SAMPLES BLOWS PER 6"	GRAPHIC LOG	DESCRIPTION	WATER CONTENT (%)	DRY DENSITY (pcf)	COHESION (psf)	STANDARD PENETRATION RESISTANCE Blows per Foot 10 20 30 40
0					Brown Medium SAND with Trace Fine Sand.				
	5								
	10								
	15								
-20	20				20.0 Fine Brown SAND.				
-25	25				25.0 SILTY SAND.				
-27					27.0 Brown SILTY CLAY.				
-32	30				**Boring terminated at 32 feet.**				
	35								
	40								

Date Drilling Started: 1 Oct 03 **Ended:** 1 Oct 03

Drilling Contractor: Contract Dewatering Services, Inc.

Driller: DN **Inspector:** _____

Notes:
1. *Boring located at center of east side.*
2. *HNu Readings 4 ppm by CDS*
   HCN Readings 0 ppm by CDS
3. *6-inch solid flight augers for drilling*
4. *Borehole backfilled with auger cuttings*

Contract Dewatering Services, Inc.

Midco I Slurry Wall

Gary, Indiana

LOG OF TEST BORING NO. CDS-3

ELEV. (ft)	DEPTH (ft)	SAMPLES NO.	SAMPLES BLOWS PER 6"	GRAPHIC LOG	DESCRIPTION	WATER CONTENT (%)	DRY DENSITY (pcf)	COHESION (psf)	STANDARD PENETRATION RESISTANCE Blows per Foot 10 20 30 40
0					Gray Medium to Fine SAND.				
	5								
	10								
-15	15				15.0 Brown Medium to Fine SAND.				
-20	20				20.0 Fine SILTY SAND.				
	25								
-27					27.0 Gray SILTY CLAY with Sand Varves.				
-29	30				29.0 Brown SILTY CLAY.				
-32					**Boring terminated at 32 feet.**				
	35								
	40								

Date Drilling Started: 1 Oct 03 **Ended:** 1 Oct 03

Drilling Contractor: Contract Dewatering Services, Inc.

Driller: DN **Inspector:** _____

Notes:
1. *Boring location is center of north side.*
2. *HNu Readings 4 ppm by CDS*
   HCN Readings 0 ppm by CDS
3. *6-inch solid flight augers used for drilling*
4. *Borehole backfilled with auger cuttings*

Contract Dewatering Services, Inc.

Midco I Slurry Wall

Gary, Indiana

LOG OF TEST BORING NO. CDS-4

Appendix B

TABLE 1-3

RANGE OF CONCENTRATIONS OF COMPOUNDS
DETECTED IN SOILS, SEDIMENT, GROUND WATER, AND SURFACE WATER
DURING THE REMEDIAL INVESTIGATION[1]
MIDCO I SITE
GARY, INDIANA

Compounds	Soils[2] (mg/kg)	Sediments (mg/kg)	Ground Water (mg/l)	Surface Water (mg/l)
Aluminum	458-31100	3370-35100	0.027-41.3	0.08-6.19
Antimony	ND-103	1.70-18	ND-0.022	ND
Arsenic[3]	ND-49	1.6-69	ND-0.066	ND-0.031
Barium	ND-1090	50-651	ND-11.4	ND-0.36
Beryllium	ND-3.4	ND-7.5	ND	ND
Cadmium	ND-17	0.84-21	ND-0.022	ND-0.011
Calcium	230-103000	4470-82400	3.05-1270	13.5-239
Chromium	ND-10200	6.5-1600	ND-5.95	ND-0.14
Cobalt	ND-20	ND-20	ND-0.091	ND-0.023
Copper	ND-29200	17-1180	ND-1.28	ND-0.497
Iron	1280-69900	8350-45800	0.064-187	0.309-96.4
Lead	2.4-4980	28-1420	ND-0.295	0.0067-0.252
Magnesium	8.81-62400	1100-21500	0.182-385	3.17-74.3
Manganese	ND-537	76-1770	0.004-6.81	0.023-3.08
Mercury	ND-3	ND-2.6	ND-0.0015	ND-0.0011
Nickel	ND-6620	7.2-805	ND-34.1	ND-0.324
Potassium	ND-5400	391-3920	3.3-486	1-29.8
Selenium	ND-3.5	ND-3.4	ND-0.04	ND
Silver	ND-11	ND-5.3	ND-0.041	ND-0.02
Sodium	ND-20500	524-16800	14.4-27600	0.443-159O
Thallium	ND-1.2	ND-19	ND-0.05	ND-0.0076
Tin	ND-470	1.80-24	ND-1.31	ND-0.025
Vanadium	ND-81	9.9-56	ND-0.15	ND-0.05
Zinc	3.1-7860	82-933	ND-3.11	0.03-0.45
Acenaphthene	ND-26	ND-0.24	ND	ND
Acenaphthylene	ND	ND-0.5	ND	ND
Acetone	ND-480	ND-17	ND-30	ND-0.59

TABLE 1-3

RANGE OF CONCENTRATIONS OF COMPOUNDS
DETECTED IN SOILS, SEDIMENT, GROUND WATER, AND SURFACE WATER
DURING THE REMEDIAL INVESTIGATION[1]
MIDCO I SITE
GARY, INDIANA

Compounds	Soils[2] (mg/kg)	Sediments (mg/kg)	Ground Water (mg/l)	Surface Water (mg/l)
Anthracene	ND-210	ND-1.1	ND-0.004	ND
Benzene	ND-14	ND-0.0042	ND-6.8	ND-0.012
Benzo(a)anthracene	ND-64	ND-1.8	ND	ND
Benzo(a)pyrene	ND-29	ND-1.8	ND	ND
Benzo(b&k)fluoranthene	ND-68	ND-3.4	ND	ND
Benzo(g,h,i)perylene	ND-18	ND-0.72	ND	ND
Benzoic acid	ND-68	ND-32	ND-130	ND
Benzyl alcohol	ND	ND	ND-0.1	ND
Bis(2-chloroethyl)ether	ND	ND	ND-0.023	ND
Bis(2-ethylhexyl)phthalate	ND-1300	ND-44	ND-0.029	ND-0.0022
2-Butanone (MEK)	ND-880	ND	ND-84	ND-0.1
Carbon disulfide	ND	ND	ND-0.0091	ND
Chlorobenzene	ND-640	ND	ND	ND
Chlordane	ND-14	ND-1.6	ND	ND
Chloroethane	ND	ND	ND-2	ND-0.036
Chloroform	ND-0.022	ND-0.00980	ND-2.7	ND
Chrysene	ND-64	ND-2	ND	ND
Cresol	ND-11	ND-1.6	ND-0.88	ND-0.014
4,4'-DDD	ND-0.0068	ND	ND	ND
Dibenzo(a,h)anthracene	ND-6.4	ND-0.21	ND	ND
Dibenzofuran	ND-22	ND-0.23	ND	ND
1,4-Dichlorobenzene	ND-0.29	ND	ND	ND
1,1-Dichloroethane	ND	ND-.047	ND-0.82	ND-0.075
1,2-Dichloroethane	ND	ND-0.0039	ND-0.1	ND-0.014
1,1-Dichloroethene	ND	ND-0.014	ND-0.1	ND
Trans-1,2-dichloroethene	ND-2.6	ND-0.011	ND-7.7	ND-0.087
2,4-Dichlorophenol	ND-0.057	ND	ND-0.0048	ND

TABLE 1-3

RANGE OF CONCENTRATIONS OF COMPOUNDS
DETECTED IN SOILS, SEDIMENT, GROUND WATER, AND SURFACE WATER
DURING THE REMEDIAL INVESTIGATION[1]
MIDCO I SITE
GARY, INDIANA

Compounds	Soils[2] (mg/kg)	Sediments (mg/kg)	Ground Water (mg/l)	Surface Water (mg/l)
2,4-Dimethylphenol	ND-0.28	ND	ND-0.16	ND
Endrin	ND-4.4	ND	ND-0.0005	ND
Ethyl benzene	ND-3100	ND	ND-1.9	ND-0.0042
Fluoranthene	ND-160	ND-4	ND-0.003	ND
Fluorene	ND-23	ND-0.31	ND	ND
Indeno(1,2,3-cd)pyrene	ND-14	ND-0.49	ND	ND
Isophorone	ND-81	ND-2.6	ND-1.5	ND-0.025
2-Methylnaphthalene	ND-140	ND-1.2	ND	ND
Methylene chloride	ND-3600	ND-0.830	ND-320	ND-0.12
Naphthalene	ND-260	ND-0.90	ND-0.022	ND
Nitrobenzene	ND-0.045	ND	ND-0.0028	ND
N-Nitrosodiphenylamine	ND-0.26	ND-0.590	ND-0.003	ND-0.0026
PCBs	ND-44	ND-10.4	ND	ND
Pentachlorophenol	ND-26	ND-0.21	ND-0.079	ND
Phenanthrene	ND-160	ND-2.1	ND-0.0052	ND
Phenol	ND-5000	ND-3.7	ND-37	ND
Pyrene	ND-110	ND-3.1	ND	ND-0.0026
Styrene	ND-280	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND-0.0086	ND	ND	ND
Tetrachloroethene	ND-350	ND	ND-0.37	ND
Toluene	ND-4100	0.14-0.043	ND-46	ND-0.44
1,1,1-Trichloroethane	ND-230	ND-0.0160	ND-7.6	ND-0.023
Trichloroethene	ND-840	ND	ND-0.91	ND-0.016
Vinyl chloride	ND	ND	ND-3	ND-0.015
Xylene	ND-3500	ND-0.15	ND-11	ND-0.17
2-Hexanone	ND-72	ND	ND-0.25	ND
4-Methyl-2-pentanone	ND-530	ND	ND-34	ND-0.069

TABLE 1-3

RANGE OF CONCENTRATIONS OF COMPOUNDS
DETECTED IN SOILS, SEDIMENT, GROUND WATER, AND SURFACE WATER
DURING THE REMEDIAL INVESTIGATION[1]
MIDCO I SITE
GARY, INDIANA

Compounds	Soils[2] (mg/kg)	Sediments (mg/kg)	Ground Water (mg/l)	Surface Water (mg/l)
Diethyl phthalate	ND-1.2	ND-0.26	ND-0.0022	ND-0.007
Butyl benzyl phthalate	ND-430	ND-1.6	ND-0.0032	ND
Di-n-octyl phthalate	ND-73	ND-4.1	ND-0.003	ND
Cyanide	ND-2720	ND-176	ND-14	ND-0.325
4-Chloro-3-methylphenol	ND-0.4	ND-0.37	ND	ND
N-Nitrosodipropylamine	ND-0.62	ND	ND	ND
Di-n-butyl phthalate	ND-190	ND-1.0	ND	ND-0.003
Dieldrin	ND-2.3	ND	ND-0.00032	ND
Aldrin	ND-0.51	ND	ND	ND
Gamma-BHC (Lindane)	ND	ND	ND-0.00025	ND
Aroclor-1242 & 1254	ND	ND-10.4	ND	ND
Aroclor-1248	ND	ND-0.64	ND	ND
4,4'-DDT	ND-0.0095	ND	ND	ND

Notes:

(1) Based on Appendices A and FB of the Remedial Investigation.
(2) Includes results of soil samples collected from the borings and the trenches.
(3) According to the amended RODs, "...the arsenic results in soil samples with aluminum concentrations greater than 10,000 mg/kg should be considered unusable because an adequate background correction for the aluminum interference was not applied..." during the RI.

Key:

MEK = Methyl ethyl ketone.
MIBK = Methyl isobutyl ketone.
ND = Not detected.
PCBs = Polychlorinated Biphenyls.

Appendix C

HYDROGEL®

For use in drilling operations where premium grade Wyoming Bentonite is desired. HYDROGEL® is a preferred product for use in oil and gas exploration drilling. It is also used in slurry trenching, caisson boring, and cast-in-place concrete foundations.

PRODUCT CHARACERISTICS:

- Manufactured to exceed API 13A, Section 4 specifications.
- 200 mesh viscosity builder.
- Yields excellent fluid loss characteristics.
- Assists in stabilizing the bore hole or trench walls.

PRODUCT SPECIFICATIONS	A.P.I. Specifications 13-A, Sec. 4-1990	Typical Hydrogel®
Barrel Yield	--	96 ± 5
Viscometer Reading at 600 R.P.M.	30 Min.	36 ± 6
Water Loss	15.0 cc Max.	13.5 ± 1
% Thru 200 Mesh Screen	--	80 ± 4
Wet Screen Analysis Residue on U.S. Sieve No. 200	4.0% Max.	3.0 ± .5
% Moisture	10.0%	7 ± 1
pH	--	9.0 ± 1.0
Gel Strength—10 Sec.	--	4 ± 1
Gel Strength—10 Min..	--	12 ± 3
Plastic Viscosity	--	12 ± 2
Yield Point, lb/200 ft.	3 x P.V. Max.	16 ± 2

Mix 20 to 50 pounds per 100 gallons of make-up water.

This product is designed to be flushed out of the well bore prior to using the well for drinking water. Before placing a well in service for drinking water it is to be properly flushed and drained until the turbidity of the water is <1 NTU above ambient turbidity.

HYDROGEL® is available in 50 pound and 100 pound multi-walled paper bags, bulk bags, or bulk.

WYO-BEN, INC. 550 S 24th St. West P.O. Box 1979 Billings, Montana 59103 USA
406-652-6351 Fax: 406-656-0748 Toll Free: 1-800-548-7055 www.wyoben.com email@wyoben.com

SW 101

The product of choice for seawater exposure and salt contaminated environments.

Wyo-Ben's unique SW 101 is an innovative breakthrough in drilling fluids and containment slurries. This contamination resistant bentonite is engineered for use in slurry cutoff walls and drilling operations where exposure to seawater is expected. It is highly recommended for use in well drilling, caisson drilling, horizontal boring and slurry wall application where traditional bentonite fluids will not perform.

SW 101

- Hydrates easily in fresh water, brackish water, seawater or a combination
- Displays excellent fluid loss control so formation sloughing is minimized
- Costs less than CMC polymer systems and builds a superior wall cake
- Has superior flow properties due to excellent bore hole stability

The salinity of typical seawater is such that conventional fresh water components cannot function properly. Similarly, materials used in saturated salt muds are not able to respond properly in the limited saline environment of seawater. The table below illustrates the properties achieved by various mud systems mixed in seawater. SW101 demonstrates superior performance and durability and is very cost effective.

Product	Percent Weight	Funnel Viscosity	600 Fann Rdg.	Fluid Loss
SW 101	6	34	15	13.7
	7	36	19	11.5
	8	38	24	9.5
API Grade Hydrogel	6	28	5	92
	7	28	5	87
	8	29	6	81
Extended Extra High Yield	6	30	11	109
	7	32	13	101
	8	34	17	95
Attapulgite Clay	6	35	24	144
	7	38	34	129
	8	44	48	120

In most operations, adding SW101 at a 7% rate to seawater is ideal (four 50# bags per 300 gallons of make-up water). For best results, establish and maintain a 45 sec/quart marsh funnel viscosity. Drilling in unconsolidated formations may require increased addition rates.

SW 101 is available in 50 pound & 100 pound bags, bulk bags and bulk.

WYO-BEN INC 550 S 24th St. West P.O. Box 1979 Billings, Montana 59103 USA
406-652-6351 Fax: 406-656-0748 Toll Free: 1-800-548-7055 www.wyoben.com email@wyoben.com

Appendix D

MATRIX FOR EVALUATING BARRIER DESIGN AGAINST ACCEPTABLE INDUSTRY PRACTICES [1]

Category	Less than Acceptable	Acceptable	Better than Acceptable	Provided for at Midco I Project
Hydrogeologic Investigation	None	Yes	>	ENVIRON Completed [2]
Feasibility Determination	None	Yes	>	ENVIRON Completed [2]
Geotechnical Design Investigation				
Borings Along Alignment	1 boring/>200 ft.	1 boring/100-200 ft.	1 boring/<100 ft.	1 boring/180 ft [3] 1 boring/ 90 ft. [4]
Geotechnical Physical testing	None	Yes	>	Yes per ERM-IR
Barrier Design				
Groundwater Modeling	No Modeling	Feasibility Modeling	Design Performance Modeling	ENVIRON Completed [2]
Alignment & Key Depth	<2 ft.	2-4 ft. key	>4 ft.	5 ft.
Wall Thickness/hydrofracture	<2 ft.	2-4 ft.	>4 ft.	2 ft.
Trench Stability and Analysis	None	Analytical	Numerical	N.A. [5]
Backfill Permeability				
Testing/optimization	<3	3 Tests	>3	2
Trench Slurry Compatibility	<3	3 Tests	>3	2
Long Term Backfill Compatibility	<3	3 Tests	>3	2
Barrier Penetration Details	None	Contractor Designed	Designer Designed	Contractor Designed
Cap/barrier Interface	None	Component Overlay	Physical Connection	Component Overlay/Clayey Soil Cap
Protection From Desiccation	<1 ft.	1-2 ft. Clay Cap	>2 ft.	1 ft. Cap of Clayey Soil
Protection From Surface Loading	None	Spanning Elements	>	At Road Use of Geogrid Remainder Span with Clayey Soil Cap
Protection From Subsurface Breach	None	Physical Protection	>	Fence
Sediment & Erosion Control	None	Contractor Designed	Designer Designed	N.A.

1. Reference Table 3-2 from "Evaluation of Subsurface Engineered Barriers at Waste Sites" EPA 542-R-98-005 August 1998
2. Completed in earlier studies.
3. Considering nine borings to be completed by Contractor Dewatering Services (four on October 1, 2003 and five prior to beginning containment wall construction.
4. Includes the borings completed by Contract Dewatering Services, the four borings by Geosciences Research Associates, Inc. in 1985, and the seven borings by Environmental Resources Management – North Central, Inc. in 1993.
5. Since the soil is never removed from the containment wall location there is no issue with trench stability

Appendix E

PRELIMINARY – IN PROGRESS

PERMEABILITY TEST REPORT

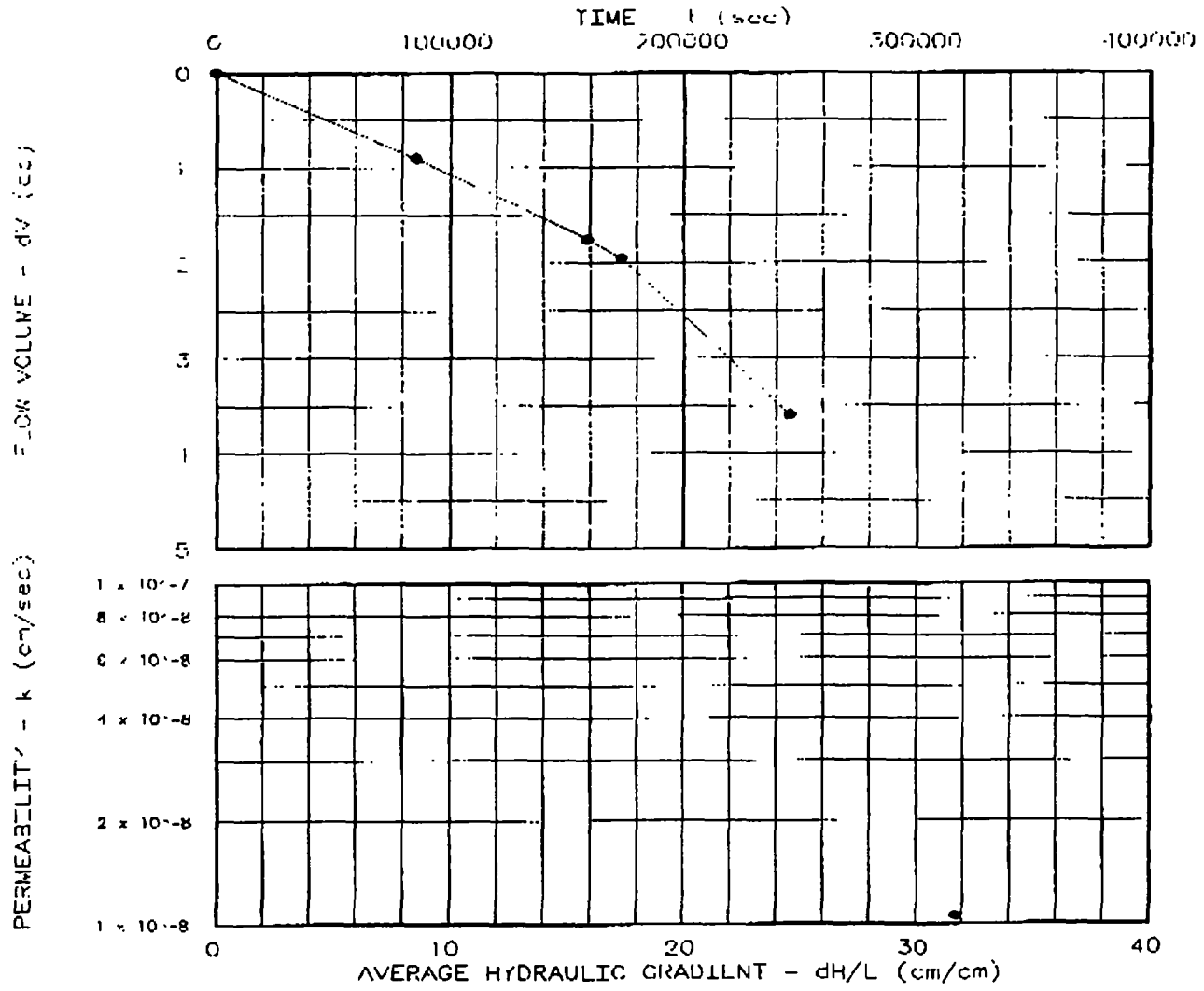
TEST DATA:
Specimen Height (cm): 5.72
Specimen Diameter (cm): 7.11
Dry Unit Weight (pcf): 101.8
Moisture Before Test (%): 31.8
Moisture After Test (%): 0.0
Run Number: 1 ● 2 ▲
Cell Pressure (psi): 24.0
Test Pressure(psi): 20.0
Back Pressure(psi): 17.4
Diff. Head (psi): 2.6
Flow Rate (cc/sec): 1.40 x 10^-5
Perm. (cm/sec): 1.06 x 10^-8

SAMPLE DATA:
Sample Identification: S-1

Visual Description: East soil, 4% Hydrogel 90 Mixed with Hydrant Water
Remarks: Permeant Water from EW 3

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: Flexible Wall
Sample type: Remolded



Project: MIDCO SLURRY WALL
Location: GARY INDIANA
Date: 10 17 03

PERMEABILITY TEST REPORT

Weaver Boos & Gordon, Inc.

Project No.: 0510352-20
File No.: 0510-352-20
Lab No.: 5
Tested by: WSG
Checked by: JWM
Test: CH – Constant Head

PERMEABILITY TEST DATA

PROJECT DATA

Project Name:	MIDCO SLURRY WALL
File No.:	0510-352-20
Project Location:	GARY. INDIANA
Project No.:	0510352-20
Sample Identification:	S-1
Lab No.:	5
Description:	East soil,4% Hydrogel90 Mixed with Hydrant Water
Sample Type:	Remolded
Max. Dry Dens.:	
Method (D1557/D698):	
Opt. Water Content:	
Date:	10 17 03
Remarks:	Permeant Water from EW-3
Permeameter Type:	Flexible Wall
Tested by:	WSG
Checked by:	JWM
Test type:	CH - Constant head

PERMEABILITY TEST SPECIMEN DATA

	Before test:			After test:		
Diameter:	1	2		1	2	
Top:	in	in		in	in	
Middle:	2.800 in	in		in	in	
Bottom:	in	in		in	in	
Average:	2.80 in	7.11 cm		0.00 in	0.00 cm	
Length:	1	2	3	1	2	3
	2.250 in	in	in	in	in	in
Average:	2.25 in	5.72 cm		0.00 in	0.00 cm	

Moisture, Density and Sample Parameters:

Specific Gravity:	2.85	
Wet Wt. & Tare:	487.80	0.00
Dry Wt. & Tare:	370.20	0.00
Tare Wt.:	0.00	0.00
Moisture Content:	31.8 %	0.0 %
Dry Unit Weight:	101.8 pcf	0.0 pcf
Porosity:	0.4279	0.0000
Saturation:	121.1 %	0.0 %

CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

Cell No.: 5 Panel No.: Positions:

Run Number:	1	2
Cell Pressure:	24.0 psi	0.0 psi
Saturation Pressure:	24.0 psi	0.0 psi
Inflow Corr. Factor:	1.00	1.00
Outflow Corr. Factor:	1.00	1.00
Test Temperature:	22.0 °C	0.0 °C

PERMEABILITY TEST READINGS DATA

CASE D X S R	DATE	TIME (24 hr)	ELAPSED TIME-sec	GAUGE PRESSURE-psi IN	GAUGE PRESSURE-psi OUT	BURET READING-cc IN	BURET READING-cc OUT	OUTFLOW/ INFLOW RATIO
S	10/25/ 3	12:56:00	0	20.0	18.0	3.30	73.60	0.00
	10/26/ 3	12:42:00	85,560	20.0	18.0	4.20	72.70	1.00
	10/27/ 3	9:01:00	158,700	20.0	18.0	5.00	71.80	1.13
	10/27/ 3	13:04:00	173,280	20.0	18.0	5.20	71.60	1.00
	10/28/ 3	9:12:00	245,760	20.0	18.0	6.70	69.80	1.20

Test Pressure = 20.0 psi Differential Head = 2.6 psi, 181.4 cm H2O
Gradient = 3.173E 01 Flow rate = 1.401E-05 cc/sec R squared = 0.95447
Permeability, K22.0° = 1.111E-08 cm/sec, K20° = 1.059E-08 cm/sec

PRELIMINARY - IN PROGRESS

PERMEABILITY TEST REPORT

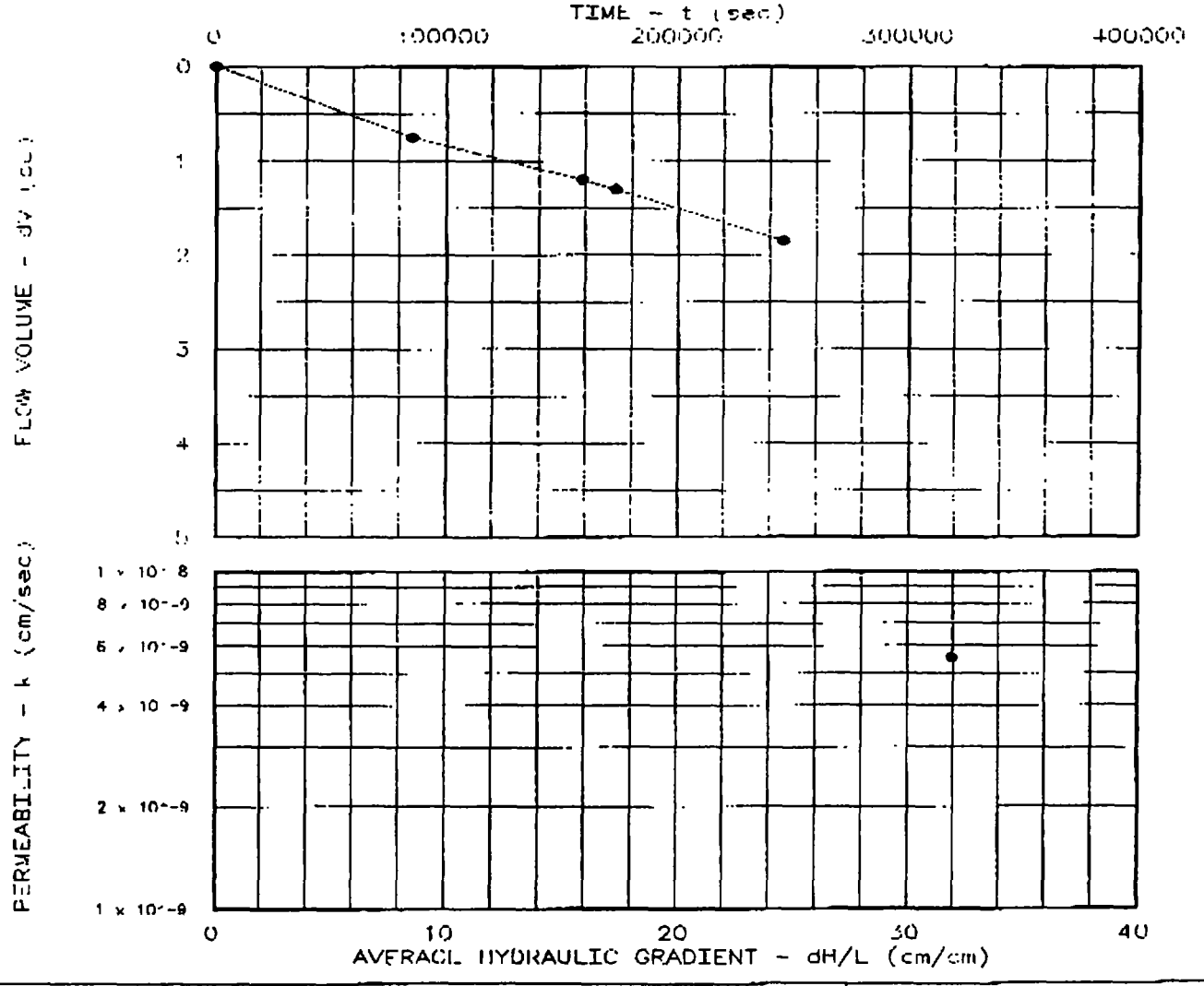
TEST DATA:
Specimen Height (cm): 5.72
Specimen Diameter (cm): 7.11
Dry Unit Weight (pcf): 98.8
Moisture Before Test (%): 42.9
Moisture After Test (%): 0.0
Run Number: 1 ● 2 ▲
Cell Pressure (psi): 21.0
Test Pressure(psi): 20.0
Back Pressure(psi): 17.4
Diff. Head (psi): 2.6
Flow Rate (cc/sec): 7.38 x 10^-5
Perm. (cm/sec): 5.54 x 10^-9

SAMPLE DATA:
Sample Identification: S-2

Visual Description: N-S-W soil, 4% SW101 Mixed with Hydrant Water
Remarks: Permeant water from MW6D

Maximum Dry Density (pcf):
Optimum Moisture Content (%):

Percent Compaction:
Permeameter type: Flexible Wall
Sample type: Remolded



Project: MIDCO SLURRY WALL
Location: GARY, INDIANA
Date: 10-17-05

PERMEABILITY TEST REPORT

Weaver Boos & Gordon, Inc.

Project No.: 0510352-20
File No.: 0510-352-20
Lab No.: 6
Tested by: WSG
Checked by: JWM
Test: CH - Constant Head

CONSTANT HEAD PERMEABILITY TEST CONDITIONS DATA

Cell No.: 6 Panel No.: Positions:

Run Number:	1	2
Cell Pressure:	24.0 psi	0.0 psi
Saturation Pressure:	24.0 psi	0.0 psi
Inflow Corr. Factor:	1.00	1.00
Outflow Corr. Factor:	1.00	1.00
Test Temperature:	22.0 °C	0.0 °C

PERMEABILITY TEST READINGS DATA

CASE D X S R	DATE	TIME (24 hr)	ELAPSED TIME-sec	GAUGE PRESSURE psi IN	GAUGE PRESSURE psi OUT	BURET READING-cc IN	BURET READING-cc OUT	OUTFLOW/ INFLOW RATIO
S	10/25/ 3	12:56:00	0	20.0	18.0	6.40	77.60	0.00
	10/26/ 3	12:42:00	85,560	20.0	18.0	7.10	76.80	1.14
	10/27/ 3	9:01:00	158,700	20.0	18.0	7.50	76.30	1.25
	10/27/ 3	13:04:00	173,280	20.0	18.0	7.60	76.20	1.00
	10/28/ 3	9:12:00	245,760	20.0	18.0	8.10	75.60	1.20

Test Pressure = 20.0 psi Differential Head = 2.6 psi, 182.7 cm H2O
Gradient = 3.196E 01 Flow rate = 7.384E-06 cc/sec R squared = 0.99568
Permeability, K22.0° = 5.815E-09 cm/sec, K20° = 5.543E-09 cm/sec

PERMEABILITY TEST DATA

PROJECT DATA

Project Name:	MIDCO SLURRY WALL
File No.:	0510-352-20
Project Location:	GARY. INDIANA
Project No.:	0510352-20
Sample Identification:	S-2
Lab No.:	6
Description:	N-S-W soil,4% SW101 Mixed with Hydrant Water
Sample Type:	Remolded
Max. Dry Dens.:	
Method (D1557/D698):	
Opt. Water Content:	
Date:	10-17-03
Remarks:	Permeant water from MW6D
Permeameter Type:	Flexible Wall
Tested by:	WSG
Checked by:	JWM
Test type:	CH - Constant head

PERMEABILITY TEST SPECIMEN DATA

	Before test:			After test:		
Diameter:	1	2		1	2	
Top:	in	in		in	in	
Middle:	2.800 in	in		in	in	
Bottom:	in	in		in	in	
Average:	2.80 in	7.11 cm		0.00 in	0.00 cm	
Length:	1	2	3	1	2	3
	2.250 in	in	in	in	in	in
Average:	2.25 in	5.72 cm		0.00 in	0.00 cm	
Moisture, Density and Sample Parameters:						
Specific Gravity:	2.85					
Wet Wt. & Tare:	513.50			0.00		
Dry Wt. & Tare:	359.40			0.00		
Tare Wt.:	0.00			0.00		
Moisture Content:	42.9 %			0.0 %		
Dry Unit Weight:	98.8 pcf			0.0 pcf		
Porosity:	0.4446			0.0000		
Saturation:	152.7 %			0.0 %		

Appendix F

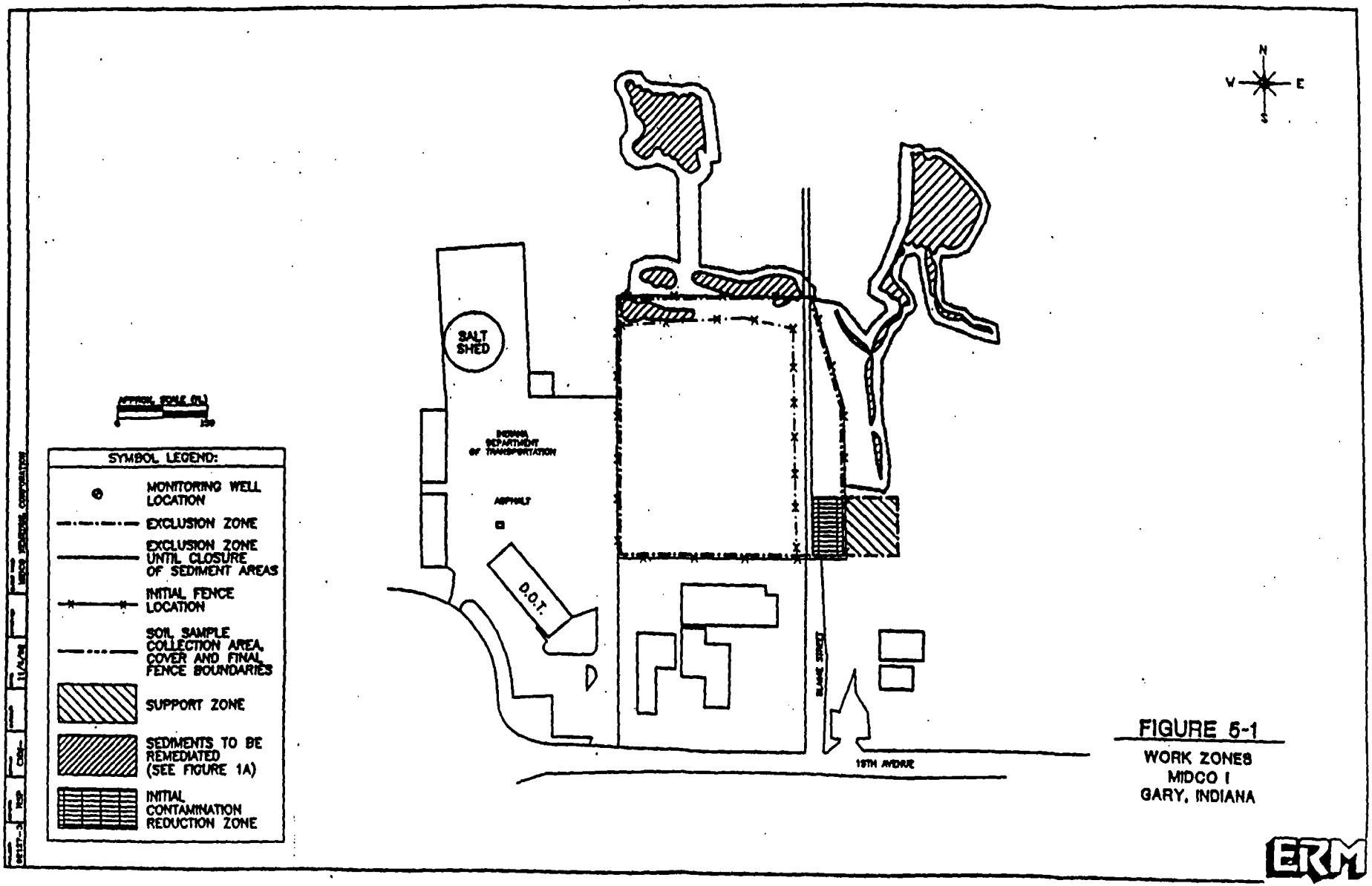


FIGURE 5-1

WORK ZONES
MIDCO I
GARY, INDIANA

ERM

CONTRACT DEWATERING SERVICES INC.

WORK PLAN FOR THE CONSTRUCTION OF A CONTAINMENT BARRIER WALL AT THE MIDCO I SITE LOCATED AT 7400 WEST 15th AVENUE, GARY, INDIANA

MOBILIZATION

Deliver to the site the required materials and equipment to successfully construct the containment barrier wall in accordance with our containment barrier wall (CBW) mix design and the project specifications.

This includes but is not limited to the following:

- Delivery of deep trencher and excavator for CBW excavation
- Delivery and set up of a water supply line to assist in CBW slurry mixing
- Delivery and staging of dry bentonite in 2800 lb. super sacks for dry mixing in the barrier wall trench
- Delivery of support equipment for site prep, assistance in CBW construction and final clean up
- Identifying the locations of any existing site utilities

SET UP WATER SUPPLY

- Lay out water line from water supply to CBW trench
- Fuse together HDPE water supply line
- Install necessary fittings for water control
- Utilize water meter provided by the water utility for metering of water quantity used

LAYOUT BARRIER WALL LOCATION

- Layout the CBW alignment by surveying techniques in accordance with the contract documents
- Locate and reveal any utilities or other lines near the CBW alignment so they will not be damaged by the trencher and they can be placed or rerouted out of the way of the CBW alignment in a controlled manner
- Expose the location of the existing extraction well lines to verify the exact location. If the extraction lines interfere with the alignment of the barrier wall, the barrier wall will need to be relocated as directed by ENVIRON.
-

- Once the CBW location is identified, layout and complete confirmation soil borings as indicated on the site plan to verify the depth to the top of the silty clay layer (key material) and the continuity of the key-in material for a depth of 5 feet.

PRE-EXCAVATION OF THE CBW TRENCH

- Using the hydraulic excavator, a 30-inch wide by 18-inch deep trench will be excavated on the exact centerline of the CBW.
- Calculate the amount of dry bentonite required to achieve a 4% ratio of dry bentonite to the backfill mix per foot of CBW constructed.
- Place the required dry bentonite out of the 2800 lb super sacks into the pre-cut trench along the CBW alignment.

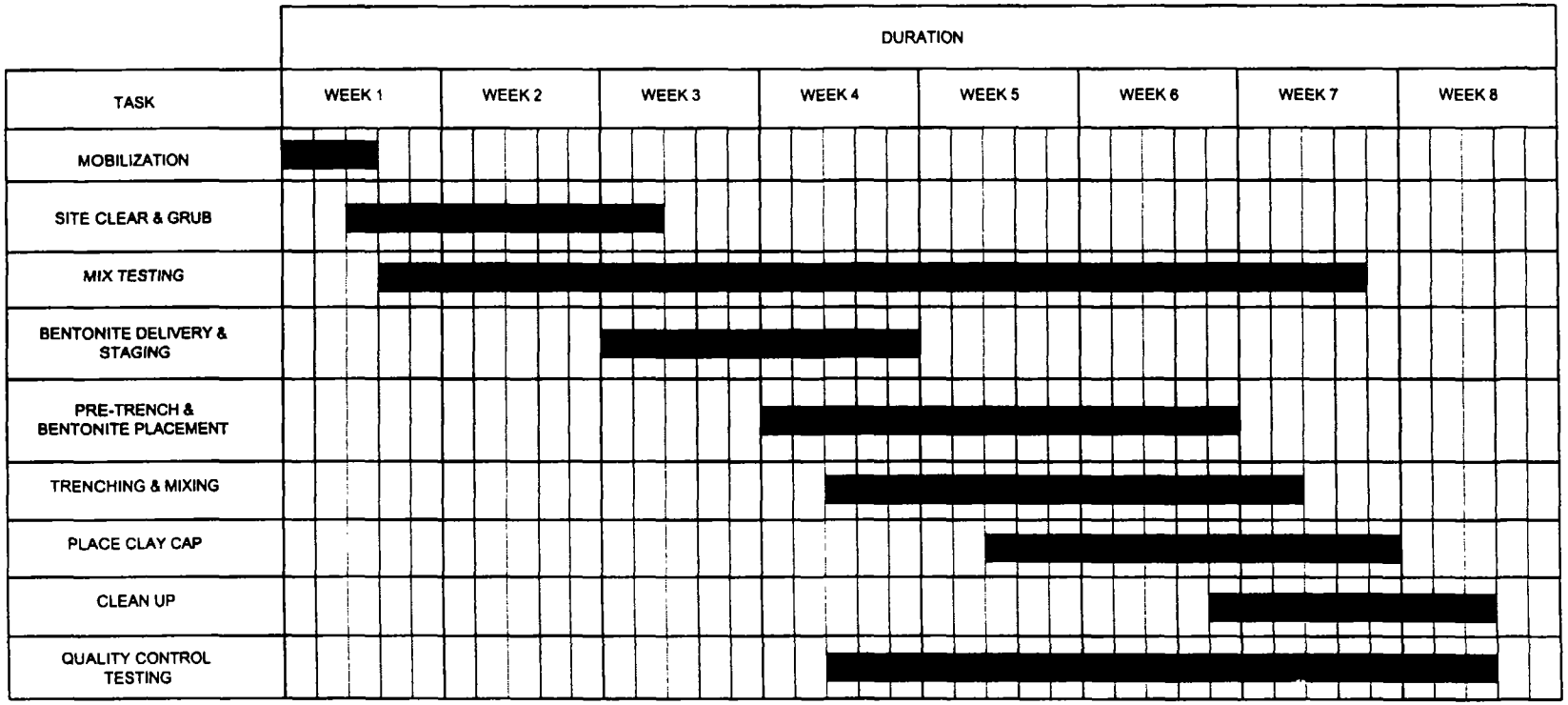
INSTALLATION OF THE CONTAINMENT BARRIER WALL

- Position trencher on centerline of the proposed CBW and set the boom in the ground to the required depth. The trench will begin at a point 2 feet beyond the perimeter of the leg of the CBW that is perpendicular to the CBW leg being constructed. The boom length is to be 36 feet long and the depth will be measured by noting the portion of the boom above the ground surface.
- Once the proper depth is reached, water will be added to the trench and mixing of the dry bentonite with the supplied water and soils will begin.
- The dry bentonite will be blended into the CBW and mixed thoroughly to the bottom of the trench with the chain of the deep trencher.
- Trenching will continue back along the centerline and water will be added to the trench as necessary to assist in mixing the dry bentonite with the trench backfill material.
- The water will be regulated so the backfill mix will maintain a slump between 4 and 8 inches. If for some reason the slump is greater than 8 inches additional dry bentonite will be added to the backfill mix to bring the slump within the required range.
- Backfill samples that are to be subjected to permeability testing will be obtained from boreholes in the completed containment barrier wall utilizing a 4-inch piston sampler at intervals as indicated in the CQC plan.
- After each 240 foot run is complete a slump test will be completed to verify that the proper slump is being maintained (1 test per 600 cy of wall placed).
- While the CBW is being constructed, we will be constantly verifying that we are achieving our five-foot key into the lower key material. The key material depth will be based upon the soil borings completed by CDS along the wall alignment. Additionally, we will note the cuttings on the trencher chain paddles for the presence of silty clay. Based upon our observations, if it appears that the trench will need to go deeper than 33 feet below the ground surface, we will back up the trenching equipment into the previously constructed trench as necessary and then extend the trench depth as necessary.

- Once we have gone through the first 100 feet and the mix percentages have been established, we will continue to install the CBW until the containment area has been completed.
- At the location where the extraction well lines cross the CBW alignment, the lines will be shut off, disconnected and the CBW trench continued beyond the extraction line alignment. Once the trench is completed in this area, the extraction HDPE lines will be reconnected utilizing electrofusion couplings and steel lines utilizing a mechanical coupler.

CLEANUP AND SITE RESTORATION

- Once the CBW construction is complete, we will finish grade over the new wall and remove all required spoil materials to the on site disposal location under the tarped area as indicated on the plans.
- CDS will place a clay cap over the CBW capable of supporting pedestrian traffic.
- At the two road crossings over the CBW an engineered repair will be constructed capable of supporting the anticipated traffic loads.
- Once the construction is complete, our support equipment will be disassembled, complete our final clean up and decontamination, and de-mobilize our equipment off site.



CONSTRUCTION SCHEDULE
MIDCO 1– BENTONITE SLURRY WALL
GARY, INDIANA

SCALE: NONE
DATE: 14 NOV 03
APPROVED BY: DANIEL L. HANSON, P.E.
DRAWN BY: AB
REVISED BY:
DATE:

PREPARED FOR: CONTRACT DEWATERING SERVICES
5820 RIVERSIDE DRIVE
SARANAC, MICHIGAN

HANSON ENGINEERING, P.C.
40595 KOPPERNICK ROAD
CANTON, MICHIGAN 48187
Phone: (734) 454-6560 Fax: (734) 454-7423

DRAWING NUMBER: 03144-001-CS

CONTRACT
DEWATERING SERVICES INC.

CONSTRUCTION QUALITY CONTROL (CQC) PLAN
FOR MIDCO I SITE
7400 WEST 15th AVENUE, GARY INDIANA

For The Installation of Containment Barrier Wall

PERSONNEL TO BE USED ON SITE:

• Construction Manager	Richard Neumann
• Construction Supervisor	Tony Miller
• Construction Fore man	Tony Miller
• CQC Representative	Matt Brooks
• Trencher Operators	Dennis Karrar and Dean Calabrese
• Utility Operator	Tom Dykas Or Local 150 Operators

OBSERVATION AND INSPECTION

Observation and inspection of the vertical containment barrier wall (CBW) construction will be performed by the Contract Dewatering Services Inc. CQC representative and will include the following:

- Visual inspection and photo documentation of the initial clearing and grubbing, workbench construction, and vertical barrier wall construction.
- Visual inspections of the lateral and vertical limits of the CBW construction.
- Documentation of the trench grades
- Visual classification and documentation of the key material
- Obtaining samples of the soil-bentonite backfill mix for laboratory testing
- Preparation of daily report documenting each days activities, locations, problems and problem resolutions, results of tests performed and samples obtained that day and quantity of materials used.

CONSTRUCTION TESTING

Soil Borings for Confirmation of Silty Clay Layer (Key-in Material)

- Prior to commencing installation of the CBW, 5 additional borings (indicated as CDB-5 to CDB-9 on Site Plan) are to be completed to verify the depth to the top of the silty clay layer (key material) and the key material layer continuity for at least 5 feet below the interface with granular materials.

Trenching

- The depth will be determined by measuring the exposed length of the 36 foot boom of the trencher.
- While the CBW is being constructed, the five-foot key into the silty clay will be verified.. The key material depth will be based upon the soil borings completed by CDS along the containment barrier wall alignment. Additionally, we will note the cuttings on the trencher chain paddles for the presence of silty clay. Based upon our observations, if it appears that the trench will need to go deeper than 33 feet below the ground surface, we will back up the trenching equipment into the previously constructed trench as necessary and then extend the trench depth as necessary.
- Each day's production will be verified by measurement

Key in Material

- The preliminary depth to the top of the key material has been determined by the completion of auger borings by Contract Dewatering Services on October 1, 2003 and other boring logs provided by ENVIRON which were completed as part of the monitoring well installation at the project site during previous environmental studies. The borings completed by Contract Dewatering Services are identified as CDB-1 to CDB-4 and are included with this design report. As previously stated, additional borings are to be completed by Contract Dewatering Services along the alignment of the CBW alignment prior to trenching activities to provide additional verification of the key material depth.
- Measurements will be taken every 10 feet to confirm the containment barrier wall is keying into the key material.

Slurry

- The dry weight percentage to be added will be calculated for each 100-foot section of the CBW. The weight will be documented. Bentonite used along the east wall will be Hydrogel supplied by Wyo-Ben. Along the north, south, and west legs of the CBW the bentonite will be SW-101, also supplied by Wyo-Ben.
- The dry bentonite will be added to the trench and disbursed evenly. The bentonite will then be mixed with the chain of the trencher until the backfill is thoroughly mixed.
- A slump test will be completed approximately every 240 feet of trench (600 cy). The slump will be maintained between 4 and 8 inches. This will also be recorded and documented.
- Dry bentonite will be added to the backfill if the slump test is greater than 8 inches. It will be added and blended until the slump is between 4 and 8 inches.
- One sample will be obtained approximately every 240 lineal feet of constructed wall (1 sample per 600 cubic yards of wall) to verify that the permeability of the CBW backfill meets or exceeds the contract requirements. The samples will be obtained by Contract Dewatering Services utilizing a 4-inch piston sampler. The depth of the samples will be random as designated by Hanson Engineering at the time of construction. The samples will be obtained by Contract Dewatering Services, Inc. and the laboratory permeability tests will be completed by Weaver Boos & Gordon LLC of Griffith, Indiana.

CONSTRUCTION DOCUMENTATION

All the daily QC reporting and measurements will be recorded in the final construction documentation. Digital and/or 35 mm photos will be furnished and labeled to identify all major aspects of the work.

A set of 22 by 34 inch as built drawings will be furnished showing all final alignment and details

EVALUATION OF PROJECT CQC WITH INDUSTRY ACCEPTABLE STANDARDS

The following pages compares the project CQC plan with the acceptable industry standards as identified in "Evaluation of Subsurface Engineered Barriers at Waste Sites" EPA 542-R-98-005 August 1998.

MATRIX FOR EVALUATING BARRIER CQA/CQC AGAINST ACCEPTABLE INDUSTRY PRACTICES [1]

(footnotes are indicated on page 2)

Category	Less than Acceptable	Acceptable	Better than Acceptable	Provided at Midco I Site
Specialty Contractor Experience	<4	4-6 Comparable Projects	>6	>6
Trench Excavation Methods	No Inspection	Periodic Inspections	Constant Inspection	Constant Inspection
Trench Width, Verticality & Continuity	No Inspection	Periodic Inspection	Measured	Equipment is set to maintain
Trench Sounding (slope and bottom)	>20 ft	Per 10-20 ft	<10 ft.	Continuous by observation of equipment boom markings
Trench Bottom Cleaning	None	Yes	>	N.A. [2]
Trench Key Confirmation	No Sampling	Sampling Every 20 feet	Sampling < 20 ft.	See footnote 3
Slurry Mixing	<	Agitation > 12 hrs. Hydration	>	N.A. [2]
Slurry Viscosity Testing	<2	2 per shift	>2	N.A. [2]
Slurry Viscosity	<40	40+ seconds	40-50 Seconds	N.A. [2]
Slurry Sand Content tests	<2	2 per shift	>2	N.A. [2]
Slurry Sand Content	>15%	<15%	<<15%	N.A. [2]
Backfill Slump Testing	<	1 per 400-600cy	>	1 per 600 cy
Backfill Slump	<3" or >6"	Most Tests 3"–6"	All Tests 3"-6"	All tests 4" – 8" [4]
Backfill Gradation Testing	<1	1 per 400-600cy	>1	N.A.[5]
Backfill Permeability testing	<1	1 per 400-600cy	>1	1 per 600 cy
Backfill Target Permeability	>	$5x10^{-7}$ - $1x10^{-7}$ cm/sec	<	$1x10^{-7}$ cm/sec [6]
Backfill Mixing/Placement	Loosely Controlled	Controlled Mix/Place	Central Mix/Guided Placement	Guided Placement
Capping Confirmation	None	Cap Confirmed	>	Cap Confirmed
Barrier Continuity	Interrupted	Continuous	Continuous & Confirmed	Continuous and Confirmed
Post Construction Barrier Sampling/Testing	None	Minimal	Regular & Documented	Regular and Documented
As-Built records	None	Construction Completion Report	Report Drawings, Test Results	Report Drawings, Test Results
Groundwater Head Monitoring	None	Monitored Fluctuation	Periodic & Across Barrier	N.A.
Final Barrier Alignment Survey	None	Surveyed	Surveyed & Monumented	Provided with As-builts
Barrier Construction Specification	None	Barrier	Barrier & CQA Plan	Barrier & CQC Plan
CQA/CQC Program and Testing Spec.	None	Designer Specified	Independent Duplicated QA	Hanson Engineering Design
Groundwater Chemistry and Monitoring	None	Minimal	Periodic & Across Barrier	N.A.

FOOTNOTES TO MATRIX FOR EVALUATING BARRIER CQA/CQC AGAINST ACCEPTABLE INDUSTRY STANDARDS

1. Table 3-4 from "Evaluation of Subsurface Engineered Barriers at Waste Sites" EPA 542-R-98-005 August 1998
2. These categories apply only to slurry trench walls constructed by excavating a trench, filled with bentonite slurry to support the trench and then backfilled with a mixture of low permeability fill. The method used for this project will consist of mixing the bentonite in-place with the existing soil without any excavation.
3. While the barrier wall is being constructed, we will be constantly verifying that we are achieving our five-foot key into the lower key material. The key material depth will be based upon the soil borings completed by CDS along the wall alignment. Additionally, we will note the cuttings on the trencher chain paddles for the presence of clay. Based upon our observations, if it appears that the trench will need to go deeper than 33 feet below the ground surface, we will back up the trenching equipment into the previously constructed trench as necessary and then extend the trench depth as necessary.
4. For the method of mixed in place soil-bentonite slurry wall that is being used on this project this slump range is acceptable since the risk of material segregation does not exist. Material segregation can occur in conventional slurry wall construction as the trench is backfilled.
5. Since the soil-bentonite slurry is thoroughly mixed in the excavated trench and not on the surface as in conventional slurry wall construction this testing is not necessary.
6. Minimum value as indicated in the request for bid proposal

MATRIX FOR EVALUATING BARRIER CQA/CQC AGAINST ACCEPTABLE INDUSTRY PRACTICES [1]

(footnotes are indicated on page 2)

Category	Less than Acceptable	Acceptable	Better than Acceptable	Provided at Midco I Site
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Backfill Slump	<3" or >6"	Most Tests 3"–6"	All Tests 3"-6"	All tests 4" – 8" [4]
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Backfill Mixing/Placement	Loosely Controlled	Controlled Mix/Place	Central Mix/Guided Placement	Guided Placement
Capping Confirmation	None	Cap Confirmed	>	Cap Confirmed
Barrier Continuity	Interrupted	Continuous	Continuous & Confirmed	Continuous and Confirmed
Post Construction Barrier Sampling/Testing	None	Minimal	Regular & Documented	Regular and Documented
As-Built records	None	Construction Completion Report	Report Drawings, Test Results	Report Drawings, Test Results
Groundwater Head Monitoring	None	Monitored Fluctuation	Periodic & Across Barrier	N.A.
Final Barrier Alignment Survey	None	Surveyed	Surveyed & Monumented	Provided with As-builts
Barrier Construction Specification	None	Barrier	Barrier & CQA Plan	Barrier & CQC Plan
CQA/CQC Program and Testing Spec.	None	Designer Specified	Independent Duplicated QA	Hanson Engineering Design
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5. Since the soil-bentonite slurry is thoroughly mixed in the excavated trench and not on the surface as in conventional slurry wall construction this testing is not necessary.
6. Minimum value as indicated in the request for bid proposal

Appendix I

MIDCO I
CONTRACT DEWATERING
HEALTH AND SAFETY PLAN

Table of Contents

CONTRACT DEWATERING SERVICES, INC.
SITE SPECIFIC HEALTH AND SAFETY PLAN
MIDCO I
7400 WEST FIFTEENTH AVENUE, GARY, INDIANA

1.0 INTRODUCTION

1.1 Site Details

Site Name: Midco I

Client: ENVIRON

Work Location Address: 7400 West Fifteenth Avenue
Gary, Indiana

Project Manager: Richard Neumann

1.2 Site History

The following site history has been obtained from the May 14, 1993 Health and Safety Plan prepared by Environmental Resource Management – North Central, Inc.

Industrial waste recycling, storage, and disposal at the Midco I site began sometime prior to June 1973. A variety of industrial wastes, including unknown quantities of bulk liquid industrial wastes, were disposed of at the site. Waste storage and disposal operations included: (1) storage in four bulk tanks with capacities ranging from 4,000 to 10,000 gallons; (2) open storage and stockpiling of 55-gallon drums; and (3) disposal of wastes into on-site pits, including industrial sludges and residues in a large, on-site pit.

The Midco I owners were notified of violations of the State's permit procedures during several site investigations conducted by the Indiana State Board of Health (ISBH) between 1973 and 1976. On December 21, 1976, a fire at Midco I that caused the emission of toxic fumes burned an estimated 14,000 drums of chemical waste. After the fire, the Midco I owners moved the facility operations to the Midco II site, and leased the Midco I site to Industrial Tectonics, Inc. (INTEC). INTEC renewed active operations at the Midco I site in October 1977.

Fire-damaged drums of waste were still at the Midco I site in 1978. During an inspection on March 15, 1979, the ISBH found that INTEC had accumulated several thousand drums of waste. The State and the USEPA collected samples of soil, waste, and ponded water from the site in April and May of 1979. The USEPA constructed a fence around the Midco I site in June 1981 and retained Ecology and Environment, Inc. (E&E) to conduct a preliminary hydrogeological study of the site between June 1981 and September 1982.

On January 27, 1982, the USEPA announced a contract award for the removal of hazardous wastes from the Midco I site. During the completion of Phases 1, 2, and 3 of the waste removal Activities, the following were removed from the site: (1) approximately 14,000 burned and crushed drums; (2) about 7,300 drums containing waste materials; (3) approximately 10,000 gallons of liquid and 8,000 gallons of sludge found in two underground storage tanks; and (4) 1 foot of contaminated soil. A clay cap, ranging in depth from 0 to 1 foot, was placed over the area of the site to the west of Blaine Street. The removal activities were completed between February 1982 and July 1982. The site was place on the National Priorities List (NPL) on September 8, 1983.

1.3 Scope of Work

The purpose of this project is to construct a containment barrier wall to isolate subsurface contamination within the limits of the containment area. Types and levels of contamination expected to be encountered as part of the Work is described in Table 1 of Section 3.4.

The objective of this containment barrier wall is to provide a continuous, vertical, hydraulic cutoff wall to isolate subsurface contamination within the containment area and prevent migration of contaminants outside of the on-site containment area. The containment barrier wall will maintain a minimum hydraulic conductivity of 1×10^{-7} cm/sec. The design of the containment barrier wall will account for the fact that the wall will be exposed to known contaminants and concentrations for an extended period of time.

1.4 Health and Safety Plan (HASP)

Contract Dewatering Services, Inc. and any subcontractors must provide trained personnel with a written, site specific, Health and Safety Plan in order to work on this site. Personnel training and HASP requirements are set forth in 29 CFR 1910.120. No contractor or agent, employee or assignee is to work at this site unless they comply in full with the health and safety requirements specified in 29 CFR 1910.120. Any employee or visitor of CDS shall have a medical surveillance physical within the past year in accordance with 29 CFR 1910.120 before they may enter the work area.

It is the policy of Contract Dewatering Services, Inc. to provide a safe workplace for its employees. To this end, the company, in concert with employees, will seek to comply with

all applicable standards promulgated pursuant to any Federal or State Occupational Safety and Health Act.

Since the most important component of any safety policy or program is implementation, it is our intent to communicate the contents of this program to our employees. In turn, all employees are expected to comply with this document and will be disciplined if found to be in non-compliance. Any questions regarding this document should be addressed to Safety Officer, Richard Neumann.

It is the policy of this company to keep its employees informed of all safety rules contained in the Construction Safety Standards and the Occupational Health Standards. Any employee may obtain a copy of the above referenced standards by contacting the company Safety Officer.

Please refer to Appendix A for our specific Job Hazard Analysis and familiarize yourself with the potential job hazards.

This HASP will be effective for the entire duration of the project. The estimated time of duration is 7 weeks.

2.0 SITE PERSONNEL

2.1 HASP Responsibilities

The **Site Safety Manager** for activities to be conducted at this site is: Richard Neumann.

The Site Safety Manager has total responsibility for ensuring that the provisions of this Site HASP is adequate and implemented in the field.

Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, the personnel assigned as Site Safety Manager is experienced and meets the additional training requirements specified by OSHA in 29 CFR 1910.120, as necessary.

Qualifications: First aid and CPR trained, 40-hour trained and subsequent refreshers.

Tony Miller may act as provisional Site Safety Manager and will have the ability for direct phone contact with Richard Neumann while on-site. **The on-site Health and Safety officer will be responsible for site monitoring.**

2.2 On-site Personnel

Richard Neumann, Project Manager
Tony Miller, Assistant Project Manager

3.0 SITE ACTIVITIES

3.1 Task Information

TASK	DESCRIPTION	DATE
1. Containment Barrier Wall Construction	Oversee and conduct activities necessary to install a containment wall providing a continuous, vertical, hydraulic cutoff isolating subsurface contamination on the south side of the site.	2003

3.2 Site Hazards

Physical: Explosive, Flammable; as identified in **Section 3.4** and Appendix C. Operational as identified in **Section 3.5**

Chemical: Absorption, Direct Contact, Ingestion, Inhalation, Potential Carcinogens as identified in **Section 3.4** and Appendix C.

Radiation: Ultra-violet; Sunlight

Biological: Animals, Insects, Plants typical for the area and season.

3.3 Potential Contaminant Media

Air, Groundwater, Soil, Surface water

3.4 Containment Evaluation

3.4.1 The following table summarizes the approximate range of concentrations of compounds detected in the soil and groundwater during the remedial investigation.

TABLE I

CONTAMINANT CONCENTRATIONS IN GROUNDWATER AND SOIL

Compounds	Units	Groundwater Concentration Range Detected	Soil Concentration Range Detected
Water Quality			
Aluminum	mg/l	0.027-41.3	458-31100
Antimony	mg/l	ND-0.022	ND-103
Arsenic	mg/l	ND-0.066	ND-49
Barium	mg/l	ND-11.4	ND-1090
Beryllium	mg/l	NA	ND-3.4
Cadmium	mg/l	ND-0.022	ND-17
Calcium	mg/l	3.05-1270	230-103000
Chromium	mg/l	ND-5.95	ND-10200
Cobalt	mg/l	ND-0.091	ND-20
Copper	mg/l	ND-1.28	ND-29200
Iron	mg/l	0.064-187	1280-69900
Lead	mg/l	ND-0.295	2.4-1420
Magnesium	mg/l	0.182-385	8.81-62400
Manganese	mg/l	0.004-6.81	ND-537
Mercury	mg/l	ND-0.0015	ND-3
Nickel	mg/l	ND-34.1	ND-6620
Potassium	mg/l	3.3-486	ND-5400
Selenium	mg/l	ND-0.04	ND-3.5
Silver	mg/l	ND-0.041	ND-11
Sodium	mg/l	14.4-27600	ND-20500
Thallium	mg/l	ND-0.05	ND-1.2
Tin	mg/l	ND-1.31	ND-470
Vanadium	mg/l	ND-0.15	ND-81
Zinc	mg/l	ND-3.11	3.1-7860
Acenaphtene	mg/l	NA	ND-26
Acenaphthylene	mg/l	NA	NA
Acetone	mg/l	ND-30	ND-480
Anthracene	mg/l	ND-0.004	ND-210
Benzene	mg/l	ND-6.8	ND-14

TABLE 1 (cont.)

CONTAMINANT CONCENTRATIONS IN GROUNDWATER AND SOIL

Compounds	Units	Groundwater Concentration Range Detected	Soil Concentration Range Detected
Benzo(a)anthracene	mg/l	NA	ND-64
Benzo(a)pyrene	mg/l	NA	ND-29
Benzo(b&k)fluoranthene	mg/l	NA	ND-68
Benzo(g,h,i)perylene	mg/l	NA	ND-18
Benzoric acid	mg/l	ND-130	ND-68
Benzyl alcohol	mg/l	ND-0.1	NA
Bis(2-chloroethyl)ether	mg/l	ND-0.023	NA
Bis(2-ethylhexyl)phthalate	mg/l	ND-0.029	ND-1300
2-Butanone (MEK)	mg/l	ND-84	ND-880
Carbon disulfide	mg/l	ND-0.0091	NA
Chlorobenzene	mg/l	NA	ND-640
Chlordane	mg/l	NA	ND-14
Chloroethane	mg/l	ND-2	NA
Chloroform	mg/l	ND-2.7	ND-0.022
Chrysene	mg/l	NA	ND-64
Cresol	mg/l	ND-0.88	ND-11
4,4'-DDD	mg/l	NA	ND-0.0068
Dibenzo(a,h)anthracene	mg/l	NA	ND-6.4
Dibenzofuran	mg/l	NA	ND-22
1,4-Dichlorobenzene	mg/l	NA	ND-0.29
1,1-Dichloroethane	mg/l	ND-0.82	NA
1,2-Dichloroethane	mg/l	ND-0.1	NA
1,1-Dichloroethene	mg/l	ND-0.1	NA
Trans-1,2-dichloroethene	mg/l	ND-7.7	ND-2.6
2,4-Dichlorophenol	mg/l	ND-0.0048	ND-0.057
2,4-Dimethylphenol	mg/l	ND-0.16	ND-0.28
Endrin	mg/l	ND-0.0005	ND-4.4
Ethyl benzene	mg/l	ND-1.9	ND-3100
Fluoranthene	mg/l	ND-0.003	ND-160
Fluorene	mg/l	NA	ND-23
Indeno(1,2,3-cd)pyrene	mg/l	NA	ND-14
Isophorone	mg/l	ND-1.5	ND-81
2-Methylnaphthalene	mg/l	NA	ND-140
Methylene chloride	mg/l	ND-320	ND-3600
Napthalene	mg/l	ND-0.022	ND-260
Nitrobenzene	mg/l	ND-0.0028	ND-0.045

TABLE 1 (cont.)

CONTAMINANT CONCENTRATIONS IN GROUNDWATER AND SOIL

Compounds	Units	Groundwater Concentration Range Detected	Soil Concentration Range Detected
N-Nitrosodiphenylamine	mg/l	ND-0.003	ND-0.26
PCBs	mg/l	NA	ND-44
Pentachlorophenol	mg/l	ND-0.079	ND-26
Phenanthrene	mg/l	ND-0.0052	ND-160
Phenol	mg/l	ND-37	ND-5000
Pyrene	mg/l	NA	ND-110
Styrene	mg/l	NA	ND-280
1,1,2,2-Tetrachloroethane	mg/l	NA	ND-0.0086
Tetrachloroethene	mg/l	ND-0.37	ND-350
Toluene	mg/l	ND-46	ND-4100
1,1,1-Trichloroethane	mg/l	ND-7.6	ND-230
Trichloroethene	mg/l	ND-0.91	ND-840
Vinyl chloride	mg/l	ND-3	NA
Xylene	mg/l	ND-11	ND-3500
2-Hexanone	mg/l	ND-0.25	ND-72
4-Methyl-2-pentanone	mg/l	ND-34	ND-530
Diethyl phthalate	mg/l	ND-0.0022	ND-1.2
Butyl benzyl phthalate	mg/l	ND-0.0032	ND-430
Di-n-octyl phthalate	mg/l	ND-0.003	ND-73
Cyanide	mg/l	ND-14	ND-2720
4-Chloro-3-methylphenol	mg/l	NA	ND-0.4
N-nitrosodipropylamine	mg/l	NA	ND-0.62
Di-n-butyl phthalate	mg/l	NA	ND-190
Dieldrin	mg/l	ND-0.00032	ND-2.3
Aldrin	mg/l	NA	ND-0.51
Gamma-BHC(Lindane)	mg/l	ND-0.00025	NA
Aroclor-1242 & 1254	mg/l	NA	NA
Aroclor-1248	mg/l	NA	NA
4,4'-DDT	mg/l	NA	ND-0.0095

3.4.2. Material Safety Data Sheets (MSDS) / Chemical Data Sheets

Material Safety Data Sheets (MSDS) and or Chemical Data Sheets from acceptable sources will be provided in Appendix C of this HASP for all chemicals, reagents,

solutions of identified materials that in the normal process of completing the tasks for this project could provide the potential for exposure. All subcontractors and any other parties working on this site will be informed of the presence of these substances and the location of the appropriate MSDS or data sheets. All subcontractors will be required to provide MSDS or Chemical Data sheets for any and all hazardous materials used or stored on site during the performance of their contracts. That information will also be made available for inclusion in Appendix C of this HASP.

3.5 Potential Operational Hazards

Potential hazards are present at the job site and may vary from day to day and task to task. All site personnel will be familiar with these potential hazards and take the appropriate precautions and any steps necessary to mitigate any potential risk from these hazards at all times. If a hazard arises that has not been identified in this HASP or discussed during the on-site safety briefings, the Site Safety Manager should be contacted immediately.

Potential Hazards include: Noise; Heat or Cold Stress; Slips, Trips and Falls; Working Over/In Water; Traffic; Heavy Equipment; Overhead Cranes/Drilling; Utilities/Electrical; High Pressure/Steam; fire and explosion/fuel and oil. The hazard analysis for each is further described in Appendix A.

There will be no open excavations greater than 5 feet and no work will be completed from heights which would require fall protection.

4.0 ACCIDENT PREVENTION PROGRAM

4.1 General Guidelines

1. It is the policy of Contract Dewatering Services, Inc. to furnish each employee employment which is free from recognized hazards that are causing or are likely to cause death or serious physical harm to such employee.

2. Contract Dewatering Services, Inc. designated Richard Neumann as corporate Safety Officer. This person is responsible for the implementation of the Company's safety program. If any employee needs to know who the Company Safety Officer is, they can find out by asking any foreman.

3. When practical, employees of Contract Dewatering Services, Inc. will participate in safety seminars sponsored by Associated Underground Contractors, Inc. and/or other organizations.

4. The Safety Officer shall designate a qualified employee on each crew or project who will have the following responsibilities:

a. Instruct each employee regarding operating procedures, hazards and safeguards of tools and equipment when necessary to perform the job.

b. Inspect the construction site, tools and equipment to assure unsafe conditions that may create a hazard are eliminated.

c. Instruct each employee in the recognition and avoidance of hazards.

d. Instruct each employee, where known harmful plants, reptiles, animals or insects are present, as to the potential hazards, how to avoid injury, and applicable first aid procedures to be used in the event of injury.

e. Instruct each employee required to handle or use known poisons, toxic materials, caustics and other harmful substances regarding the potential hazards, how to avoid injury, and applicable first aid procedures to be used in the event of injury.

f. Instruct each employee required to enter a confined space regarding the Hazards involved, the necessary precautions to be taken, the use of personal protective equipment, and the procedures to be followed if an emergency occurs. For this project there is no expectation of confined space entry requirements.

g. Instruct all employees in the steps to be taken in case of an injury or accident.

5. Contract Dewatering Services, Inc. shall not knowingly permit an employee to work while under the influence of intoxicating beverages or substances which would impair the employee's ability to perform a task in a safe manner. Additionally, no employee shall possess/use intoxicating beverages or controlling substances at any Contract Dewatering Services, Inc. site or facility. Any employee violating this policy is subject to immediate dismissal.

6. The job foreman will inspect all machines, tools and equipment on a regular basis to make certain that no defect is present that will affect the safety of employees.

7. All employee complaints or concerns regarding safety shall be immediately brought to the attention of the Safety Officer.

8. Periodic meetings will be held to inform all employees of the company safety program.

9. This safety program shall be made available to all employees.

10. A copy of the AUC Trench Safety Handbook shall be made available to all employees who are involved in working in open excavations.

11. Employees will adhere to the following Safety Rules.

4.2 Miscellaneous Rules

1. Do not use tools or equipment that you have not been trained or authorized to use. This rule also applies to power activated tools.

2. Gasoline must be stored and transported in approved cans only. Engines must be shut-off when refueling and no smoking anywhere near flammable liquids.

3. Immediately report all injuries, whether to yourself or a co-worker, to your foreman.

4.3 Trenching Rules

1. All employees outside of a cabbed vehicle or covered piece of equipment must wear a hard hat. Never use metal hard hats.

2. All employees working in excavations or trenches must always stay within the protective system (trench shield, shoring, sloping).

3. Never climb on shoring, trench shields, or sloped walls or ride on any lift, hook, chain, cable, sling, or other equipment parts.

4. Ladders in a trench must extend at least 3 feet above the top of the trench. All employees working in a trench must be within 25 feet of a ladder or ramp.

5. For further excavation information, refer to the AUC *Trench Safety Handbook.*

6. All trenches over 5' deep must be cut to the angle of repose, sheeted or shored.

4.4 Personal Protective Equipment Rules

1. All employees outside of a cabbed vehicle or covered piece of equipment must wear a hard hat. Never use metal hard hats.

2. Wear proper eye protection (goggles, safety glasses, etc.) when necessary.

3. Hearing protection shall be used where loud noise is present.

4. Wear safety vests when directing traffic.

5. Proper clothing will be worn, including hard toe work boots when required, shirts and pants.

6. In the event that any work task needs to be performed above the PPE levels described in the CDS Health and Safety plan, the following rules will apply: A written plan will be furnished to all site personnel explaining the level of PPE required. This plan will describe the PPE and the daily use and maintenance of the PPE. Under no circumstances will work be carried out unless a written plan for the required PPE level is in place and reviewed by all employees.

4.5 Heavy Equipment Rules

1. Every employee, not just the equipment operator, must be fully aware of all safety aspects of heavy construction equipment.

2. Be constantly alert when working around heavy equipment. The operator cannot always see other personnel around his equipment. Stay out from under suspended loads, away from moving equipment, and counterweights.

3. Only designated individuals shall be permitted to operate or service heavy equipment.

4. Perform frequent and periodic inspection as required.

5. The equipment operator must wear the seat belt when required.

6. No employee is permitted to ride on any part of the equipment.

7. It is the responsibility of all employees to make certain that back-up alarms on obstructed rear view heavy equipment be in operable condition.

8. Maintain a 10' minimum clearance from energized lines, use a spotter in difficult areas.

All employees who engage in any activities at this site are obligated to read and comply with the requirements in this HASP. A statement that these individuals have read and will comply with these requirements must be signed before entering the site (Appendix B). A copy of this plan and the compliance statement will be maintained at an on-site field location during all field activities.

In accordance with this SSHASP, PPE guidelines, and 29 CFR 1910.132, prior to personnel beginning work at the site, the Site Safety Manager will have evaluated conditions and verified that the personal protective equipment selection outlined within this HASP is appropriate for the hazards known or expected to EXIST.

5.0 PROJECT DESCRIPTION/TASK EVALUATION

The Midco I project involves one task as identified in section 3.1. A risk assessment of those tasks has identified the level of risk associated with each task and the corresponding level of protection required.

5.1 Containment Barrier Wall Construction

Contract Dewatering will provide oversight and construction of the containment barrier wall.

5.1.1 Personal Protective Equipment (PPE):

For Levels A-D refer to Section 6.4

5.1.2 Potential Hazards, Risk Level and Justification

Hazard	Risk Level	Justification
Chemical	Dermal: High * Respiratory: High * Ingestion: Low *	Contamination is present in site soils and groundwater, and is potentially present in ambient air.

* Risk levels as defined by ERM HASP for Midco I Site

Physical	Low	There are slip, trip and fall hazards. Depending on the weather, heat or cold may be an issue. Explosion and fire from fuel and oil stored on site for equipment operation.
	High	Heavy equipment and excavation activities with a backhoe
Biological	Low	Exposure to plants and animals is not expected. Proper PPE should be worn at all times.
Radiological	Low	No ionizing radiation hazards are known to exist in the area. Non-ionizing radiation hazards will be present in the form of sunlight. Site personnel should be aware of the hazards and take proper precautions for overexposure. Precautions include: sunscreen, working in the shade when

possible, taking breaks in the shade, and wearing a hat for head and face protection.

5.1.3 Levels of Protection/Justification

Level D PPE will be worn for all tasks. Additional PPE may be worn to help to avoid contact with potential biological hazards, to prevent exposure to the sun and other weather-related hazards, and to keep workers clean. Dependent upon the data obtained during on-site air monitoring, higher levels of PPE **(Levels C – A)** may be required.

5.1.4 Safety Procedures Required and/or Field OPS Utilized

Follow applicable safety procedures outlined in this HASP and follow the buddy system. SOPs are contained in the Contract Dewatering manual and is available from the site manager

6.0 SITE CONTROL

6.1 Engineering Controls

For all tasks, PID and HCN monitoring should be conducted on a continuous basis. CDS Health and Safety officer will be taking air monitoring readings every 30 minutes and recording the data on daily reports.

The exclusion zone around the intrusion area will be identified with caution tape and a sign will be posted at the entrance of the exclusion zone stating that no unauthorized entry is allowed.

6.1.1 On-Site Ambient Air Monitoring

1. Direct-Reading Instruments

Direct-reading instruments will be used to provide information during construction of the containment barrier and enable workers to make rapid decisions. During construction activities, VOCs and HCN will be continuously measured in the work areas at the site. Since the soil at the site will be continuously wet as a result of the construction method used in the soil-bentonite slurry wall fugitive dust will not be created that will require monitoring for other constituents. Therefore, only continuous VOC and HCN monitoring will be conducted according to the procedures described in the following paragraphs:

A. Volatile Organic Compounds

On-site VOC emissions will be continuously monitored by using a photoionization detector (PID) instrument, HNu Model PI-101, or equivalent, with an 11.7eV lamp. The HNu is capable of semiquantitatively detecting VOC concentrations ranging from 0.1 to 2,000 parts per million by volume (Vppm) of isobutylene equivalents. Detailed instructions on the use of the HNu are to be with the equipment at all times.

Field personnel will strictly follow the VOC action levels set for this project based on the HNu readings shown in **Section 7.1**.

B. Hydrogen Cyanide

A Compur 4100 SD Monitox HCN Detector, or equivalent, will be used to determine the presence and concentration of HCN in the air. The HCN meter is equipped with a diffusion-type electrochemical sensor specific for HCN and is capable of measuring concentrations from 0 to 100 ppm. Audible and LED alarms attached to the meter would be activated by a concentration of HCN that would constitute an emergency condition. Detailed instructions on the use of the Compur 4100 SD Monitox Detector, or equivalent, are to be with the equipment at all times.

The most exposed person in each field crew involved with intrusive work tasks of any nature will be required to wear an HCN detector to monitor the air in his or her breathing zone. If HCN is detected by the Monitox detector, workers will strictly follow the required action levels and will use the designated equipment shown in **Section 7.2**. If the Monitox detector indicates the presence of HCN at the site, the downwind facility boundary will be monitored with the Monitox detector. HCN monitoring and response actions are summarized on Figure 7-2 (Appendix D - Hydrogen Cyanide Monitoring and Response Flow Chart (as provided in ERM Site HASP) the HCN monitoring and response flow chart).

The resulting data will be used to determine whether on-site personnel are being exposed to concentrations that exceed exposure in the ambient air, stack emission limits, or action levels for specific hazardous materials. All air monitoring results will be recorded in the On-Site PSO's field notebook and will be used to specify the level of respiratory protection required for each specific field activity. Prior to the daily initiation of work, all monitoring equipment will be calibrated in accordance with the manufacturers' operating manual.

6.2 Administrative Controls

Personnel will attend regular safety meetings prior to initiation of site work. Contract Dewatering personnel will check in with the site manager periodically and at the end of the day to maintain communications and will stay upwind and away from heavy equipment when possible.

6.2.1 Emergency Response Information

1. As part of its safety program it is the policy of Contract Dewatering to make certain that all employees have been instructed as to proper procedures in case of an injury or accident.

2. Contract Dewatering designates the 911 system as its first response in the event of a medical emergency and/or rescue operation.

3. A list of emergency phone numbers will be posted at the jobsite when practical. If no suitable or convenient location exists, the list will be kept by the project foreman.

4. All injuries and/or accidents shall be reported to the job foreman immediately.

5. All accidents and/or injuries shall be reported to the Safety Officer as soon as is practical.

6. Contract Dewatering will provide a person at each job site who is trained in CPR and First Aid procedures as required by any applicable Safety & Health Standards.

7. Never move an injured person unless absolutely necessary. Further injury may result. Keep the injured comfortable and utilize available first aid equipment until an ambulance arrives.

6.3 Personnel Protective Equipment (PPE)

6.3.1 Personal Protective Equipment Policy

It is the policy of Contract Dewatering that all employees comply with the Indiana Occupational Safety and Health Act (IOSHA) standards in regards to the use of personal protective equipment. Violation of this policy will be subject to discipline as outlined in this section.

1. This company shall provide all personal protective equipment as required in IOSHA standards.

2. All employees outside of a cabbed vehicle or a covered piece of equipment must wear a hard hat. There will be no exceptions to this rule.

3. All employees must wear required hand protection, gloves, etc., when an employee is exposed to hazards such as radiation, alkalies, acids, adhesives and

temperature extremes other than those caused by weather conditions. Appropriate hand protection other than ordinary work gloves will be supplied by the company.

4. Any employee directing vehicular traffic must wear a fluorescent orange vest.

5. All employees must wear proper foot protection if conditions on the job are likely to cause foot injury. Tennis shoes or similar footwear is strictly forbidden.

6. The use of face and eye protection will vary according to the task performed. All employees must consult with the qualified employee to determine the proper method of protection and this protective gear must be worn.

7. Any personal protective equipment that is found to be defective shall be immediately reported to the safety officer or qualified person.

8. Acknowledgment of receipt of personal protective equipment will be kept on file at the company office.

9. A company disciplinary policy is in effect regarding personal protective equipment and is available to all employees upon request.

6.4 Description of Levels of Protection -During All Tasks

Protection Equipment	Level D	Level C	Level B	Level A
Head: Hard Hat	X	X	X	X
Full-face air-purifying respirator (OSHA/NIOSH approved)		X		
Eye and Face: Safety glasses or goggles if necessary	X	X	X	X
Hearing: Ear plugs or muffs if necessary	X	X	X	X
Appropriate Work Uniform	X	X	X	X
Coveralls	X	X	X	X
Chemical-resistant clothing, disposable, hooded, one-or-two piece chemical splash suit		X	X	X

Protection Equipment	Level D	Level C	Level B	Level A
Gloves: Inner if necessary to keep clean	X			
Gloves: Inner chemical resistant		X	X	X
Gloves: Outer Chemical Resistant	X	X	X	X
Boots/Shoes (inner): steel toe and shank, chemical resistant	X	X	X	X
Boots: Outer Chemical Resistant, disposable	X	X	X	X
Boots: Water resistant overboots if necessary	X			
Escape Mask	Optional	Optional	Optional	Optional
2-way communication		Optional	X	X
Other: sunscreen if necessary	X			
SCBA – pressure-demand regulator (OSHA/NIOSH approved)			X	X
Fully encapsulating chemical resistant suit				X

6.5 Heat Stress Disorders -During All Tasks

Heat stress disorders are common among workers exposed to extreme heat and humidity. Provisions will be made for frequent work breaks and fluid replacement according to the following schedule:

Suggested Frequency of Work Breaks and Fluid Replacement For Fit and Acclimatized Workers

Adjusted Air Temperature*	Modified D Normal Work Ensemble**
90° F or above	After Each 45 Minutes Work
87.5° to 90° F	After Each 60 Minutes Work

82.5° to 87.5° F	After Each 90 Minutes Work
77.5° F to 82.5° F	After Each 120 Minutes Work
Below 77.5° F	After Each 120 Minutes Work

* Calculate the adjusted air temperature by using the equation for dry bulb use: Adjusted Air Temp F = Thermometer Reading F (13 X Estimated % Sunshine), % Sunshine is estimated by judging what proportion of time the sun is not covered by clouds thick enough to produce a shadow.

** Modified Normal Work Ensemble consists of a Tyvek Suit over lightweight cotton clothing.

Heat stress disorders can be fatal if not attended to properly. All workers on site will be instructed in the signs and symptoms of, and First Aid for Heat Cramps, Heat Exhaustion and Heat Stroke.

6.6 Exposure to Cold -During All Tasks

Cold exposure and hypothermia are prevented or mitigated by provision of heated compartments on heavy equipment, and heated facilities for worker breaks.

TLV's[1] Work Warm Up Suggested Schedule for Four Hour Shifts

Air Temperature – Sunny Sky	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
Degree F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-15 to -19 deg.	(Norm.. Break)	1	(Norm. Break)	1	75 min	2	55 min.	3	40 min.	5
-20 to -24 deg.	(Norm. Break)	1	75 min	2	55 min.	3	40 min.	5	30 min	5
-25 to -29 deg.	75 min	2	55 min.	3	40 min.	5	30 min	5	Non-emergency work should cease	
-30 to -34 deg.	55 min.	3	40 min.	5	30 min	5	Non-emergency work should cease			
-35 to -39 deg.	40 min.	5	30 min	5	Non-emergency work should cease					
-40 to -44 deg.	30 min	5	Non-emergency work should cease							
-45 deg & below	Non-emergency work should cease									

1. TLV = Threshold Limit Value

7.0 SITE AIR MONITORING PROGRAM

During all tasks, organic and inorganic gases and vapors, and particulates will be monitored. During construction activities, VOCs and HCN will be continuously measured in the work areas at the site. Since the soil at the site will be continuously wet as a result of the construction method used in the soil-bentonite slurry wall fugitive dust will not be created that will require monitoring for other constituents. The results of monitoring of the worker breathing zone will be compared to the action levels listed below to verify that employees have not been overexposed to hazardous levels and to determine whether higher levels of respiratory protection, engineering controls, or new work practices are necessary for worker protection. Exposure limits and recognition qualities are presented on Table 4-1.The following **Action Levels** indicate the appropriate response. These Action Levels, if not defined by regulation, are some percent (usually 50%) of the applicable PEL/REL/TL V. That number must also be adjusted for instrument response factors.

7.1 Organic Gases and Vapors

ACTION LEVEL	PROTECTIVE MEASURES
Background	Level D – No respiratory protection needed
Background to 5 ppm above background	Level C – Full-face respirator with organic Vapor cartridges
5 ppm to 500 ppm above background	Level B – Self-contained breathing apparatus
500 ppm to 1,000 ppm above background	Level A – Fully encapsulating suit

7.2 Inorganic Gases, Vapors and Particulates

ACTION LEVEL	PROTECTIVE MEASURES
No detectable readings for HCN	Level D – No respiratory protection needed
Any detectable reading for HCN	Level B – Self-contained breathing apparatus with full face piece and hooded Saranex-coated Tyvek coveralls
Above 10 ppm for HCN	Level A – Fully encapsulating suit

8.0 CONTINGENCIES

8.1 Emergency Contacts and Phone Numbers

AGENCY	CONTACT	PHONE NUMBER
Local Medical Emergency Facility (LMEF)	Emergency Room St. Catherine Hospital	(219) 392-1700
Medical Emergency Contact	John Flak	(630) 466-9578 Office [redacted]
Health and Safety	Dick Neumann	(616) 560-2199 Cellular
City of Gary Fire Department	Fire Department	911 or (219) 881-4782
City of Gary Police Department	Police Department	911 or (219) 881-1260
Site Phone	Contract Dewatering Mobile Phone	(616) 902-0370 Tony Miller Cellular
Nearest Phone	Contract Dewatering Mobile Phone	(616) 902-0370 Tony Miller Cellular
National Response Center		(800) 424-8802
USEPA		(800) 621-3191
IDEM – Emergency Response		(888) 233-7745
City of Gary Ambulance Service –EMS Dir.		(219) 881-5285
Lake County Sheriff		(219) 886-3621
Lake County Health Department		(219)755-3655
Poison Center		(800) 222-1222

8.2 Local Medical Emergency Facility

HealthCare St. Catherine Hospital
4321 Fir Street
East Chicago, IN 46312

Phone No. (219) 392-1700

Name of Contact: **EMERGENCY available 24 hours**
Type of Service: **Physical Trauma and Chemical Exposure**
Travel time from site: Approximately 10 minutes
Distance to hospital: Approximately 5 miles
No. of 24 hour Ambulance Service: 911
Directions: Take West 15th. Avenue west to Cline Avenue. Turn north on Cline Avenue

(right) to Columbus Drive Exit (Route 12) west. Go west on Columbus (turn left off of Cline Avenue) for four traffic lights and turn left on Elm Street.
NOTE: There are hospital direction signs along Columbus Drive and the emergency room is located on the east side of the hospital on Elm Street.

Map is Provided in Appendix D

8.3 Response Plans

8.3.1 Medical - General

Provide First Aid as trained, assess and determine need for further medical assistance. Transport or arrange for transport after appropriate decontamination. First Aid Kit. No eyewash or shower required. No Health Facility on site.

8.3.2 Spill/Release

In the event of a spill or release, ensure safety, assess situation and perform containment and control measures as appropriate.

a. **Clean up per MSDS if small or; Sound Alarm, call for assistance. Notify Emergency Coordinator**
b. **Evacuate to pre-determined safe place.**
c. **Account for personnel.**
d. **Determine if Team can respond safely.**
e. **Mobilize per Site Spill Response Plan.**

8.3.3 Fire/Explosion

In the event of a fire or explosion, ensure personal safety, assess situation and perform containment and control measures as appropriate.

FIRE EXTINGUISHER: ABC located in Vehicle, Construction Equipment, or on Drilling Rig

a. **Sound Alarm and call for assistance. Notify Emergency Coordinator.**
b. **Evacuate to pre-determined safe place.**
c. **Account for personnel.**
d. **Use fire extinguisher. ONLY IF SAFE AND TRAINED.**
e. **Standby to inform Emergency responders of materials and conditions.**

8.3.4 Security Problems

Plan to respond to security problems is to call **911** on mobile phone.

8.3.5 Accident and Incident Reporting

All accidents and injuries must be reported to a foreman or the Site Safety Manager immediately. The supervisor or contractor representative will complete the reporting process as described in the Federal Safety Program.

All environmental, health and safety incidents and data will be recorded in the field record books. Any OSHA and/or required Federal or State forms or logs will be maintained at the office of Contract Dewatering.

8.4 Decontamination Plan

Consistent with the levels of protection required, step-by-step procedures for personnel decontamination for each Level of Protection are given below.

LEVEL D / LEVEL C - DECONTAMINATION PLAN

Segregated equipment drop	Drop equipment in a designated area for decontamination or proper disposal.
Tape removal - outer glove and boot	If necessary
Boot cover removal	If necessary , place in trash bag or disposal container
Outer glove removal	If necessary , place in trash bag or disposal container
Suit removal	If necessary , place in trash bag or disposal container
Inner glove removal	If necessary , place in trash bag or disposal container
Respirator Cartridges	If necessary , place in trash bag or disposal container

CRC / SAFE ZONE BOUNDARY

Field Wash	Wash hands and face with soap and water as soon as possible and before eating or drinking or other hand to mouth activity.
Disposal Plan, End of Day	At end of the day the trash bag with the PPE will be closed up and staged in a secure area.
Disposal Plan, End of week	Material will be stored in a secure area.
Disposal Plan, End of project	Material will be disposed of in an appropriately permitted landfill

Specific criteria for Levels B and A are provided in the Appendix of the ERM HASP developed for the Midco I site.

8.4.1 Levels of Protection Required for Decontamination Personnel

The level of protection required for personnel assisting with decontamination will be Level D unless Level C has been initiated, then Level C is required.

8.4.2 Disposition of Decontamination Waste

All decontaminated wastes generated by Contract Dewatering personnel will be staged with the contractor decontamination waste and will be disposed of in accordance with the disposal criteria set forth in the Midco I HASP criteria. Subcontractor will be responsible

8.4.3 Equipment Decontamination

Equipment will be decontaminated by steam cleaning to remove any encrusted materials or residual contamination. All steam cleaning, wash, and rinse activities will be conducted within the contamination reduction zone on a decontamination pad constructed in the decontamination area. The pad will be pitched to the center to allow the drainage and accumulation of decontamination water into a central sump. Wastewaters will be removed from the sump with a wet vacuum or a submersible pump and placed: (1) in 55-gallon drums, or (2) directly into a storage tank(s) located within the support facilities. All decontamination wastewater generated during the field activities will be stored either in drums located on the concrete pad installed within the drum storage area or in the storage tank(s), and disposed in accordance with all local, State, and Federal regulations.

If Contract Dewatering equipment (phone, pm, etc.) requires decontamination, they will be wiped down with a paper towel soaked in an alconox water wash and rinsed with a clean water rinse.
Any subcontractor and their subcontractors will be responsible for the decontamination procedures of their equipment and their procedures will be identified in their respective HASP documents.

9.0 PERSONNEL RESPONSIBILITIES AND STATUS OF CERTIFICATION

The Site Health and Safety Manager are responsible for verifying all certifications and fit tests.

	Richard Neumann	***Tony Miller***		
Title	**Project Manager**	**Site Safety Manager**		
Tasks	**All**	**All**		
Relevant Cert. Completed	**All**	**All**		
Medical *Surveillance* Current*	**Yes**	**Yes**		
Training Current **	**Yes**	**Yes**		

* Medical Current -Medical Monitoring Requirements: All personnel including visitors, entering the exclusion or contamination reduction zones must be certified as medically fit to work, and to wear a respirator, if appropriate, in accordance with 29 CFR 1910, 29 CFR 1926/1910 or 29 CFR 1910.120. Any employee or visitor of CDS shall have a medical surveillance physical within the past year in accordance with 29 CFR 1910.120 before they may enter the work area.

** Training Current -Training: All personnel, including visitors, entering the exclusion or containment reduction zones must have certifications of completion of training in accordance with OSHA 29 CFR 1910, 29 CFR 1926 or 29CFR 1910.120.

9.1 RESPONSIBILITIES OF FOREMAN / QUALIFIED EMPLOYEE

1. Assure that the safety program is implemented.
2. Inspect the job site to assure that no unsafe conditions exist.
3. Make sure that necessary protective equipment is on hand and used when required.
4. Instruct all employees in safe procedures and job safety requirements. Follow up and insist on compliance.
5. Discuss safety with employees on every operation. Have periodic safety meetings.
6. See that all injuries are cared for properly and reported promptly.

7. Investigate all accidents. File a complete accident report with the Safety Officer and correct the causes immediately. Use OSHA FORM 301.

8. Be familiar with the rules pertaining to safety.

9. Report any hazardous conditions to the Safety Officer even if the condition has been corrected.

10. Recommend reprimands for employees found in non-compliance of safety program and related materials.

9.2 DISCIPLINE POLICY

It is the policy of **Contract Dewatering** to supply its employees with a workplace which is free from recognized hazards. **Contract Dewatering** will provide to each employee the proper tools, equipment, **Contract Dewatering** is concerned with your safety and requires you to take advantage of these measures for your protection.

In order to ensure your compliance with this policy, the following schedule of disciplinary action shall apply to any employee found to be in violation of the required procedures:

First Offense	Written warning filed in employees permanent file (effective for one year from date of issue).
Second Offense	Written warning filed in employees permanent file (effective for one year from date of issue).
Third Offense	Subject to suspension without pay for a length of time to be determined at time of offense.
Subsequent Offenses	Subject to dismissal or suspension without pay for a length of time to be determined at time of offense.

Safety is everyone's' responsibility. The safety rules of **Contract Dewatering** in place to protect you and your fellow employees and these rules will be enforced.

Employee Signature:_____

Date:_____

10.0 TRAINING AND BRIEFING TOPICS

The following items will be covered at the site-specific training meeting, daily or periodically:

- Site characterization and analysis, Sec. 3.0,29 CFR 1910.1201
- Physical Hazards, Section 3.2.
- Chemical Hazards, Section 3.4.
- Animal bites, stings and poisonous plants
- Site Control
- Engineering Controls and Work Practices
- Heavy machinery -Drill Rig
- Backhoe
- Equipment
- Tools
- Overhead and Underground Utilities
- Personnel Protective Equipment, Section 5.4; 25 CFR 1910 .120a
- Level A,B,C,D
- Monitoring, Section 6.0; 29 CFR 1910 120h
- Decontamination, Section 7.4; 29CFR 1910, 120k
- Procedures for handling site emergency incidents
- Shipping and transport. 49CFR 172.101
- Illumination. 29 CFR 1910.120m

11.0 SUBCONTRACTOR'S HEALTH AND SAFETY PROGRAM EVALUATION

Subcontractors are responsible for their own HASP, which will be reviewed by Hanson Engineering P.C. No subcontractors are anticipated.

APPENDIX A

Appendix A

Job Hazard Analysis

1. MOBILIZATION AND DEMOBILIZATION

Hazard: Equipment Accidents

Controls:

a. Assure that all equipment (including trucks) is equipped with ROPS, seat belts, back-up alarms, and fire extinguishers.
b. Use signaler while loading and unloading. Act only on signaler's signal. Signaler shall wear a reflective orange vest.
c. Assure that all equipment is in safe operating condition.
d. Limit loading and off-loading during wet or freezing conditions.
e. Require use of seat belts.
f. Use only trained and authorized equipment operators.
g. Equipment inspections at the start of each shift. All equipment removed and subsequently returned to the site shall be reinserted.

Hazard: Material Handling Accidents

Controls:

a. Furnish personal protective equipment such as hard hats, gloves, protective shoes, eye protection, etc.
b. Instruct employees in proper lifting techniques to prevent back injury. Reinforce proper lifting technique when lifting observed.
c. Use equipment whenever possible for lifting (with proper lifting apparatus.)
d. Disallow employee's exposure to suspended loads
e. Use only qualified "riggers" for hooking, lifting and landing materials.

2. FUEL STORAGE AND EQUIPMENT REFUELING

Hazard: Fire

Controls:

a. Furnish and mount fire extinguishers.
b. Place "No Smoking" and "No Open Flame" signs on storage tanks.
c. Place dikes around storage tanks.
d. Prohibit smoking or open flames with 50 feet of where equipment is being refueled.
e. Dispensing systems shall be electrically bonded and grounded.
f. Portable fuel containers shall be approved safety cans.
g. Storage tanks shall be equipped with relief valves.

3. USE OF CRANE OR BOOM TRUCK

Hazard: Equipment Accidents

Controls:

a. Operator will have chart posted so as to know maximum loads at different boom angles.
b. Safety belts shall be worn at all times.
c. Boom will be kept at a safe distance from power lines. It will never be closer than 10 feet
d. Operator shall not leave crane unattended when holding a load.

Hazard: Falling

Controls:

a. Anyone lifted shall be secured with a safety belt
b. Operator shall be positioned so as to see man in the basket at all times.
c. Persons shall be lifted only with cranes that have power up and power down modes.

4. EXCAVATION AND EMBANKMENT/PLACING AGGREGATE AND STONE

Hazard: Equipment Accidents

Controls:

a. Assure that all equipment (including trucks) is equipped with ROPS, seat belts, back-up alarms and fire extinguishers.
b. Rigid schedule and equipment safety component and preventative maintenance.
c. Orient equipment operators in safety methods.
d. Inspect all equipment at beginning of workshift to determine safe operating conditions.
e. Require use of seat belts.
f. Use signalman. Signalmen shall wear orange reflective vests.

5. CONCRETE

Hazard: Concrete Burns

Controls:

a. Assure employees wear proper clothing and safety equipment (i.e. long sleeves, boots, safety goggles, gloves, etc.)
b. Use trained and experienced personnel only.
c. Assure personnel using curing compound to wear safety glasses.

6. FORMWORK

Hazard: Personal Injury

Controls:

a. Forms will be stacked out of the way of equipment
b. Nails will be removed, as forms are unassembled.

c. Those using release agents will wear eye protection.
d. Heavy large forms will be handled with several men or equipment.

7. CLEARING
Hazard: Chain Saws
Controls:
a. Inspect chain saws at the beginning of work shift to determine safe operating conditions.
b. Furnish personal protective equipment such as eye, ear, hand foot (safety shoes) protection, etc.
c. Assure that operators are aware of proper operating procedures such as sure footing, holding the saw with both hands, etc.
d. Educate employees to the dangers of falling trees, kick-back, etc.
e. Assure that operators are aware of any obstacles lying in the path of falling trees.

8. HOUSEKEEPING
Hazard: Personal Injury
Controls:
a. Tools, materials, extension cords, hoses or debris shall not cause tripping or other hazards.
b. Empty bags containing lime, cement or other dust-producing material shall be removed periodically.
c. Protruding nails in scrap boards, planks and timber shall be removed, hammered in or bent over flush.
d. Walkways, runways and sidewalks shall be kept clear of all obstructions. Adequate accessways shall be provided and protected.
e. Keep gas and other flammable materials away from heaters and in a secure area.
f. Wet or oily spills shall be cleaned up immediately.
g. Be sure heaters have proper ventilation and clearance from walls.
h. Gas cans must have fire arresters and screens.

9. USE OF ELECTRICAL TOOLS
Hazard: Fires -Electrical Shock
Controls:
a. Have approved fire extinguishers on site.
b. Patched, oil soaked, worn or frayed electrical cords or cables shall not be used.
c. GFI shall be required for use with any electrical tool.
d. Maintain electrical power equipment daily and check for cracked, split or frayed cords and repair same.
e. Wet hands or standing water is prohibited when using any electrical tool.

f. Make absolutely sure that the electrical power tool being used has a true ground or is double insulated.
g. Do not abuse or misuse power tools or handle them by their electrical cords.

10. POWER TOOLS
Hazard: Personal Injury
Controls:
a. Power tools shall not be left running and unattended. Only experienced operators will be allowed to use power tools.
b. Eye protection, face shields, and hearing protection shall be worn.
c. Proper personnel safety equipment shall be used.
d. Use the right tool for the right job.
e. Tools shall be kept in proper working order and checked daily, including protective guards.
f. Electrical cords shall be in good condition and properly grounded.
g. Avoid using aluminum or other metal ladders on electrical jobs or near electrical lines.

11. DRILLING EQUIPMENT
Hazard: Personal Injury
Controls:
a. Equipment operators shall be properly trained in the operation of their specific type of drilling rig.
b. Make sure drilling rig has gone through a visual inspection to identify any present safety hazards.
c. Be sure that all guards are in place and all pinch points are identified.
d. Proper eye and ear protection must be worn at all times.
e. Drill rig shall be equipped with a fire extinguisher, OSHA approved first aid kit, and OSHA approved safety belts and lanyards for climbing on rig or derrick.
f. Helpers and support personnel shall be briefed on all related health and safety hazards prior to beginning each phase of the work.
g. Any open hole shall not be left unprotected; it shall be covered and identified with a caution tape barrier.
h. All lifting apparatuses, cable and rigging hardware shall be visually inspected daily and any deficient equipment or material shall be replaced before any work may continue.
i. Weather conditions shall be monitored and at the first sight of lightning, the drilling crew will shut down until the threat of lightning is out of the area.
j. Should any drilling fluids be used, MSDS sheets will be available for review by any workers on site.

k. When any drilling is performed on sheeting cells or near sheeted excavations where a falling hazard would occur, hand rails must be in place before CDS employees can begin any of their work.

l. On any drilling location, if open water hazards are present, PFD's will be worn by the workers that are in the hazard areas.

12. USE OF CRANE OR BOOM TRUCK

a. Hazard: Equipment Accidents

Controls:

1. Operator will have chart posted so as to know maximum loads at different boom angles.
2. Safety belts shall be worn at all times.
3. Boom will be kept at a safe distance from power lines. It will never be closer than ten feet.
4. Operator shall not leave crane unattended when holding a load.

b. Hazard: Falling

Controls:

1. Anyone lifted shall be secured with an OSHA approved harness.
2. Operator shall be positioned so as to see man in the basket at all times.
3. Persons shall be lifted only with cranes that have power up and power down modes.

13. TRENCHING ACTIVITIES

a. Mobilization and Demobilization

1. Hazard: Equipment Accidents

Controls:

a. Always check moving permits for any irregularities
b. Proper loading, always measures height off of ground
c Use adequate size and number of chain and binders to secure to low boy trailer.

b. Slurry Wall Installation

1. Hazard: Unloading and Staging the Bentonite

Controls:

a. Always be sure to use the proper spreaders. The spreaders must have four legs.
b. Any handling device must be able to support the super sacks by all four straps.
c. Never get under the live load. The straps or lifting device could fail causing serious injury.

c. Mixing the Bentonite Slurry
   1. Hazard: Personal Injury
      Controls:
      a. Dust emissions produced by the bentonite slurry mixing process will be below nuisance levels; therefore, no mandatory respirator plan will be required. Dust masks will be available on a voluntary basis for those who request them as provided for in Appendix D of the OSHA Respiration Protection Regulations.

d. Slurry Wall Construction
   1. Hazard: Open Trench
      Controls:
      a. Keep trench area identified and limit access to personnel not working on the slurry trench.
   2. Hazard: Fresh Slurry Trench
      a. Limit access into slurry wall construction area until the constructed wall has a cap placed over it. This will prevent anyone from accidentally stepping into the slurry trench.

APPENDIX B

Appendix B

CONTRACT DEWATERING SERVICES INC.
EMPLOYEE SIGN-OFF SHEET

_____, an employee of CONTRACT DEWATERING SERVICES, INC. have read and understand this health and safety policy. I also understand that if I have any questions concerning the safety policy or safety in general I may contact the company safety officer for clarification. Further, I understand that safety is everyone's responsibility, including my own.

Signed: _____

Date: _____

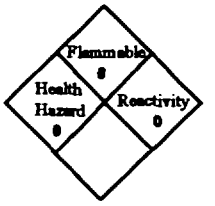
APPENDIX C

MSDS
CHEMICAL DATA SHEETS

1. Wyo-Ben Hydrogel
2. Wyo-Ben SW-101

WYO-BEN, INC.

MATERIAL SAFETY DATA SHEET



NFPA FIRE HAZARD IDENTIFICATION SYSTEM

I. PRODUCT IDENTIFICATION

Trade Name(s): **HYDROGEL®**

Generic Name(s): Wyoming (Western) Bentonite; Bentonite Clay (CAS No. 1302-78-9)

Chemical Name(s): Sodium Montmorillonite (CAS No. 1318-93-0)

Manufacturer: **WYO-BEN, INC.** Address: P.O. Box 1979 Billings, Montana 59103	Telephone Numbers: Information: (406) 652-6351 EMERGENCY: (406) 652-6351

II. HAZARDOUS INGREDIENTS

Ingredient	CAS NO.	%	Hazard
Crystalline Silica (SiO_2) as Quartz	14808-60-7	See Note	Low concentrations of crystalline silica (SiO_2) in the form of quartz may be present in airborne bentonite dust. See Section VI for discussion of health hazard.

Note: Although the typical quartz content of western bentonite is in the range of 2 to 6% most of the quartz particles are larger than the 10 μ respirable threshold size. The actual respirable quartz concentration in airborne bentonite dust will depend upon bentonite source, fineness of product, moisture content of product, local humidity and wind condition at point of use and other use specific factors.

III. PHYSICAL DATA

Boiling Point (°F): NA	Specific Gravity (H_2O=1): 2.45-2.55
Vapor Pressure (mm. Hg): NA	Melting Point: Approx. 1450°C
Vapor Density (Air = 1): NA	Evaporation Rate (Butyl Acetate = 1): NA
Solubility in Water: Insoluble, forms colloidal suspension.	pH: 8-10 (5% aqueous suspension)
Density (at 20° C): 55 lbs./cu.ft. as product.	

Appearance and Odor: Bluegray to green as moist solid, light tan to gray as dry powder. No odor.

IV. FIRE AND EXPLOSION DATA

Flash Point: NA	Flammable Limits: LEL: NA UEL: NA

Special Fire Fighting Procedures: NA

Unusual Fire and Explosion Hazards: None. Product will not support combustion.

Extinguishing Media: None for product. Any media can be used for the packaging. Product becomes slippery when wet.

V. REACTIVITY

Stability: Stable

Hazardous Polymerization: None

Incompatibility: None

Hazardous Decomposition Products: None

NA = Not Applicable ND = Not Determined

Date Prepared: March 15, 2001

Doc #: 1020-00

VI. HEALTH HAZARD INFORMATION

Routes of Exposure and Effects:

Skin: Possible drying resulting in dermatitis.

Eyes: Mechanical irritant.

Inhalation: *Acute* (short term) exposure to dust levels exceeding the PEL may cause irritation of respiratory tract resulting in a dry cough. *Chronic* (long term) exposure to airborne bentonite dust containing respirable size ($\leq 10\ \mu$) quartz particles, where respirable quartz particle levels are higher than TLV's, may lead to development of silicosis or other respiratory problems. Persistent dry cough and labored breathing upon exertion may be symptomatic.

Ingestion: No adverse effects.

Permissible Exposure Limits: (for air contaminants)	OSHA PEL (8hr. TWA)	ACGIH TLV
Bentonite as "Particulates not otherwise regulated" (formerly nuisance dust)		
Total dust	15mg/m^3	ND
Respirable dust	5mg/m^3	ND
Crystalline Quartz (respirable)	0.1mg/m^3	0.1mg/m^3

Carcinogenicity: Bentonite is not listed by ACGIH, IARC, NTP or OSHA. IARC, 1997, concludes that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica from occupational sources (IARC Class 1), that carcinogenicity was not detected in all industrial circumstances studied and that carcinogenicity may depend on characteristics of the crystalline silica or on external factors affecting its biological activity. NTP classifies respirable crystalline silica as "known to be a human carcinogen" (NTP 9th Report on Carcinogens – 2000). ACGIH classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Acute Oral LD_{50}: ND	Acute Dermal LD_{50}: ND	Aquatic Toxicology LC_{50}: ND

Emergency and First Aid Procedures:

Skin: Wash with soap and water until clean.

Eyes: Flush with water until irritation ceases.

Inhalation: Move to area free from dust. If symptoms of irritation persist contact physician. Inhalation may aggravate existing respiratory illness.

VII. HANDLING AND USE PRECAUTIONS

Steps to be Taken if Material is Released or Spilled: Avoid breathing dust; wear respirator approved for silica bearing dust. Vacuum up to avoid generating airborne dust. Avoid using water. Product slippery when wetted.

Waste Disposal Methods: Product should be disposed of in accordance with applicable local, state and federal regulations.

Handling and Storage Precautions: Use NIOSH/MSHA respirators approved for silica bearing dust when free silica containing airborne bentonite dust levels exceed PEL/TLV's. Clean up spills promptly to avoid making dust. Storage area floors may become slippery if wetted.

VIII. INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation Requirements: Mechanical, general room ventilation. Use local ventilation to maintain PEL's/TLV's.

Respirator: Use respirators approved by NIOSH/MSHA for silica bearing dust.

Eye Protection: Generally not necessary. Personal preference.

Gloves: Generally not necessary. Personal preference.

Other Protective Clothing or Equipment: None

IX. SPECIAL PRECAUTIONS

Avoid prolonged inhalation of airborne dust.

DEPARTMENT OF TRANSPORTATION HAZARDOUS MATERIAL INFORMATION

Shipping Name: NA (Not Regulated)	Hazard Class: NA
Hazardous Substance: NA	Caution Labeling: NA

Date Prepared: March 15, 2001 Doc #: 1020-00

All information presented herein is believed to be accurate, however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances. No warranty or guarantee, expressed or implied is made by WYO-BEN, INC. as to this information, or as to the safety, toxicity or effect of the use of this product.

WYO-BEN, INC.

MATERIAL SAFETY DATA SHEET

NFPA FIRE HAZARD IDENTIFICATION SYSTEM

I. PRODUCT IDENTIFICATION

Trade Name(s): **SW 101**

Generic Name(s): Wyoming (Western) Bentonite; Bentonite Clay (CAS No. 1302-78-9) and other proprietary ingredients

Chemical Name(s): Sodium Montmorillonite (CAS No. 1318-93-0) and other proprietary ingredients

Manufacturer:	**WYO-BEN, INC.**	Telephone Numbers:	
Address:	P.O. Box 1979	Information:	(406) 652-6351
	Billings, Montana 59103	EMERGENCY:	(406) 652-6351

II. HAZARDOUS INGREDIENTS

Ingredient	CAS NO.	%	Hazard
Crystalline Silica (SiO_2) as Quartz	14808-60-7	See Note	Low concentrations of crystalline silica (SiO_2) in the form of quartz may be present in airborne bentonite dust. See Section VI for discussion of health hazard.

Note 1: The specific chemical identity of this product is being withheld as a trade secret. In the event of a medical emergency it will be provided to a treating medical professional under the provisions of 29 CFR 1910.1200(i).

Note 2: Although the typical quartz content of western bentonite is in the range of 2 to 6% most of the quartz particles are larger than the 10 μ respirable threshold size. The actual respirable quartz concentration in airborne bentonite dust will depend upon bentonite source, fineness of product, moisture content of product, local humidity and wind condition at point of use and other use specific factors.

III. PHYSICAL DATA

Boiling Point (°F): NA	Specific Gravity (H_2O=1): 2.45-2.55
Vapor Pressure (mm. Hg): NA	Melting Point: Approx. 1450°C
Vapor Density (Air = 1): NA	Evaporation Rate (Butyl Acetate = 1): NA
Solubility in Water: Insoluble, forms colloidal suspension.	pH: 8-10 (5% aqueous suspension)
Density (at 20° C): 55 lbs./cu.ft. as product.	

Appearance and Odor: Bluegray to green as moist solid, light tan to gray as dry powder. No odor.

IV. FIRE AND EXPLOSION DATA

Flash Point: NA	Flammable Limits: LEL: NA UEL: NA

Special Fire Fighting Procedures: NA

Unusual Fire and Explosion Hazards: None. Product will not support combustion.

Extinguishing Media: None for product. Any media can be used for the packaging. Product becomes slippery when wet.

V. REACTIVITY

Stability: Stable

Hazardous Polymerization: None

Incompatibility: None

Hazardous Decomposition Products: None

NA = Not Applicable ND = Not Determined

Doc #: 4360-00

Date Prepared: August 30, 2001

VI. HEALTH HAZARD INFORMATION

Routes of Exposure and Effects:

Skin: Possible drying resulting in dermatitis.

Eyes: Mechanical irritant.

Inhalation: *Acute* (short term) exposure to dust levels exceeding the PEL may cause irritation of respiratory tract resulting in a dry cough. *Chronic* (long term) exposure to airborne bentonite dust containing respirable size ($\leq 10\ \mu$) quartz particles, where respirable quartz particle levels are higher than TLV's, may lead to development of silicosis or other respiratory problems. Persistent dry cough and labored breathing upon exertion may be symptomatic.

Ingestion: No adverse effects.

Permissible Exposure Limits: (for air contaminants)	OSHA PEL (8hr. TWA)	ACGIH TLV
Bentonite as "Particulates not otherwise regulated" (formerly nuisance dust)		
Total dust	15mg/m^3	ND
Respirable dust	5mg/m^3	ND
Crystalline Quartz (respirable)	0.1mg/m^3	0.1mg/m^3

Carcinogenicity: Bentonite is not listed by ACGIH, IARC, NTP or OSHA. IARC, 1997, concludes that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica from occupational sources (IARC Class 1), that carcinogenicity was not detected in all industrial circumstances studied and that carcinogenicity may depend on characteristics of the crystalline silica or on external factors affecting its biological activity. NTP classifies respirable crystalline silica as "known to be a human carcinogen" (NTP 9th Report on Carcinogens – 2000). ACGIH classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Acute Oral LD_{50}: ND	Acute Dermal LD_{50}: ND	Aquatic Toxicology LC_{50}: ND

Emergency and First Aid Procedures:

Skin: Wash with soap and water until clean.

Eyes: Flush with water until irritation ceases.

Inhalation: Move to area free from dust. If symptoms of irritation persist contact physician. Inhalation may aggravate existing respiratory illness.

VII. HANDLING AND USE PRECAUTIONS

Steps to be Taken if Material is Released or Spilled: Avoid breathing dust; wear respirator approved for silica bearing dust. Vacuum up to avoid generating airborne dust. Avoid using water. Product slippery when wetted.

Waste Disposal Methods: Product should be disposed of in accordance with applicable local, state and federal regulations.

Handling and Storage Precautions: Use NIOSH/MSHA respirators approved for silica bearing dust when free silica containing airborne bentonite dust levels exceed PEL/TLV's. Clean up spills promptly to avoid making dust. Storage area floors may become slippery if wetted.

VIII. INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation Requirements: Mechanical, general room ventilation. Use local ventilation to maintain PEL's/TLV's.

Respirator: Use respirators approved by NIOSH/MSHA for silica bearing dust.

Eye Protection: Generally not necessary. Personal preference.

Gloves: Generally not necessary. Personal preference.

Other Protective Clothing or Equipment: None

IX. SPECIAL PRECAUTIONS

Avoid prolonged inhalation of airborne dust.

DEPARTMENT OF TRANSPORTATION HAZARDOUS MATERIAL INFORMATION

Shipping Name: NA (Not Regulated)	Hazard Class: NA
Hazardous Substance: NA	Caution Labeling: NA

Date Prepared: August 30, 2001 Doc #: 4360-00

APPENDIX D

Figure 3-1 – Map from Site to Nearest Hospital (as provided in ERM Site HASP)

Figure 7-2 – Hydrogen Cyanide Monitoring and Response Flow Chart (as provided in ERM Site HASP)

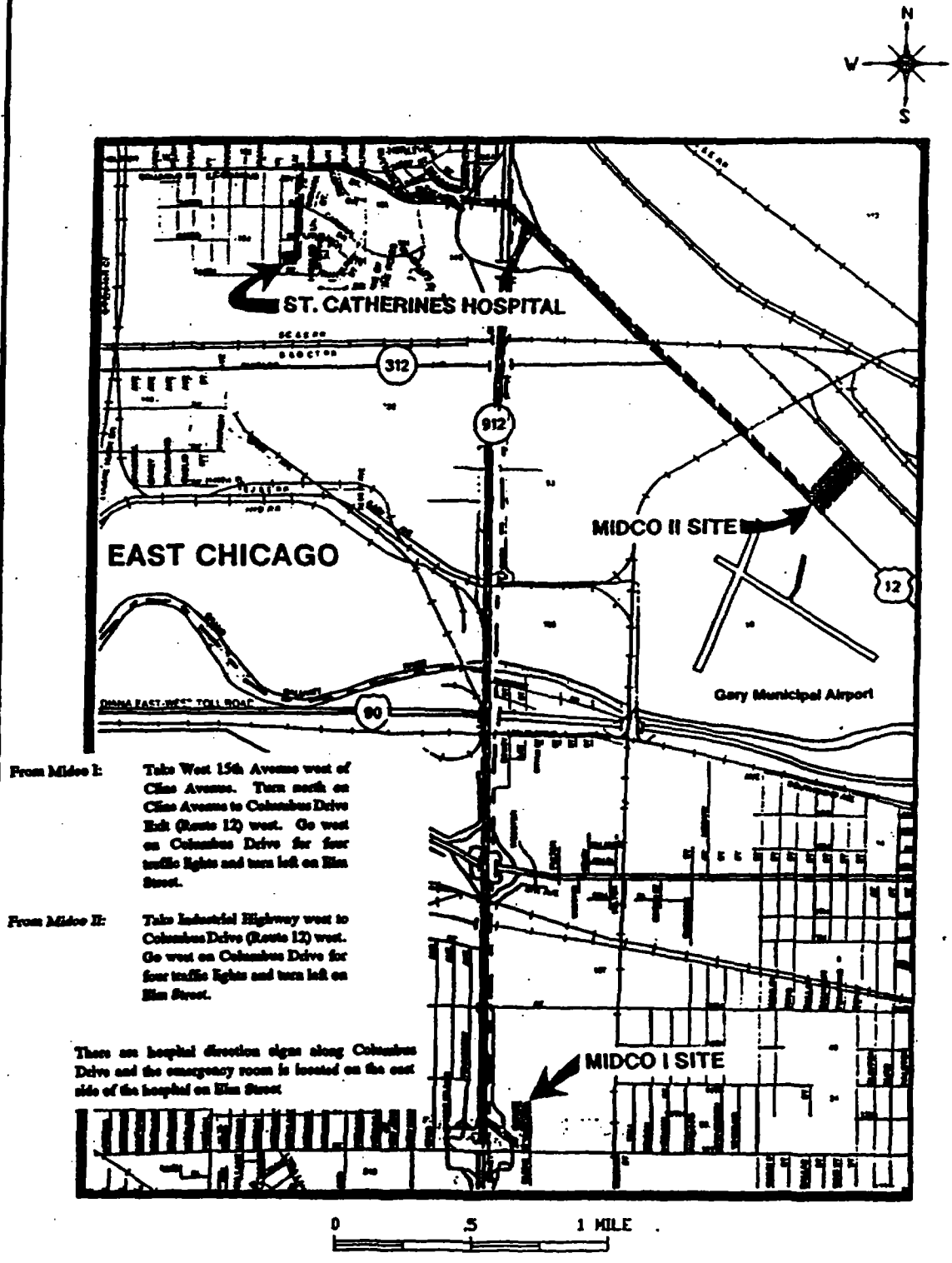


FIGURE 3-1

EMERGENCY ROUTES TO HOSPITAL
MIDCO I AND MIDCO II
GARY, INDIANA

ERM

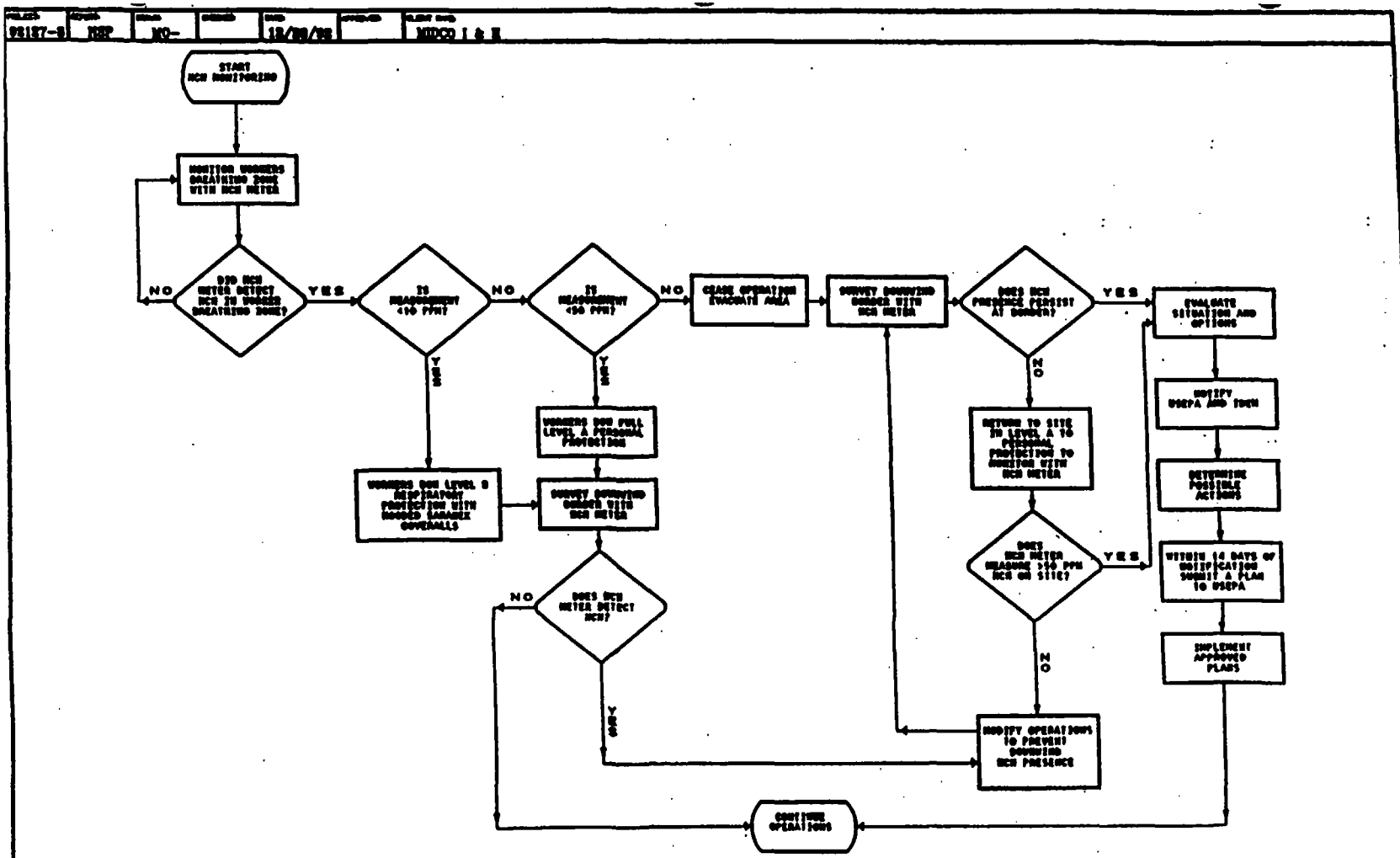


FIGURE 7-2

HYDROGEN CYANIDE
MONITORING AND RESPONSE FLOW CHART
MIDCO I AND II
GARY, INDIANA

ERM

APPENDIX E

Table 4-1(Updated November 2003) – Exposure Limits and Recognition Qualities of Various Compounds

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Volatile Organic Compounds:								
Acetone	1,000 ppm	250 ppm	2,500 ppm	1,000 ppm	750 ppm	colorless	fragrant, mint-like	liquid
Benzene	1 ppm	Ca 0.1 ppm[7]	Ca 500 ppm[8]	5 ppm	[10 ppm][9]	colorless to light yellow	aromatic	liquid (solid below 42° F)
2-Butanone (Methyl ethyl ketone)	200 ppm	200 ppm	3,000 ppm	300 ppm	200 ppm	colorless	moderately sharp, fragrant, mint- or acetone-like	liquid
Carbon disulfide	20 ppm	1 ppm	500 ppm	12 ppm	10 ppm	colorless to faint yellow	sweet, ether-like (reagent grades are foul smelling)	liquid
Carbon tetrachloride	10 ppm	Ca[7] 2 ppm	Ca 300 ppm[8]	10 ppm	[5 ppm][9]	colorless	characteristic ether-like	liquid
Chlorobenzene	75 ppm	N.E.	1,000 ppm		10 ppm	colorless	almond-like	liquid
Chloroethane (Ethyl chloride)	1,000 ppm	N.E.	3,800 ppm		1,000 ppm	colorless	pungent, ether-like	gas or liquid (below 54° F)
Chloroform	50 ppm	Ca[7] 2 ppm	Ca 500 ppm[8]	2 ppm	10 ppm[9]	colorless	pleasant	liquid
1,1-Dichloroethane	100 ppm	199 ppm	3,000 ppm		100 ppm	colorless	chloroform-like	oily liquid
1,2-Dichloroethane (Ethylene dichloride)	50 ppm	Ca 1 ppm[7]	Ca 50 ppm[8]	2 ppm	10 ppm	colorless	pleasant, chloroform-like	liquid

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Volatile Organic Compounds (continued):								
1,1-Dichloroethene (Vinylidene chloride)					5 ppm			
1,2-Dichloropropane (Propylene dichloride)	75 ppm	Ca[7]	Ca 400 ppm[8]	110 ppm	75 ppm	colorless	chloroform-like	liquid
Ethyl benzene	100 ppm	100 ppm	800 ppm	125 ppm	100 ppm	colorless	aromatic	liquid
2-Hexanone (Methyl n-butyl ketone)	100 ppm	1 ppm	1,600 ppm		5 ppm	colorless	acetone-like	liquid
Methylene chloride	25 ppm	Ca[7]	Ca 2,300 ppm[8]		50 ppm[9]	colorless	chloroform-like	liquid (gas above 104° F)
4-Methyl-2-pentanone (Hexone, Methyl isobutyl ketone)	100 ppm	50 ppm	500 ppm	75 ppm	50 ppm	colorless	pleasant	liquid
Styrene	100 ppm	50 ppm	700 ppm	100 ppm	50 ppm	colorless to yellow	sweet, floral	oily liquid
1,1,2,2-Tetrachloroethane	5 ppm	Ca 1 ppm[7]	Ca 100 ppm[8]		1 ppm	colorless to pale yellow	pungent, chloroform-like	liquid
Tetrachloroethene (Tetrachloroethylene/ Perchloroethylene)	100 ppm	Ca[7]	150 ppm[8]	100 ppm	[25 ppm]	colorless	mild, chloroform-like	liquid
Toluene	200 ppm	100 ppm	500 ppm	150 ppm	50 ppm	colorless	sweet, pungent, benzene-like	liquid

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Volatile Organic Compounds (continued):								
1,2,4-Trichlorobenzene			5 ppm		5 ppm[10]			
1,1,1-Trichloroethane (Methyl chloroform)	350 ppm	350 ppm	700 ppm	450 ppm	350 ppm	colorless	mild, chloroform-like	liquid
1,1,2-Trichloroethane	10 ppm	Ca 10 ppm[7]	Ca 100 ppm[8]		10 ppm	colorless	sweet, chloroform-like	liquid
Trichloroethylene (Trichloroethene)	100 ppm	Ca 25 ppm[7]	Ca 1,000 ppm[8]	200 ppm	[50 ppm]	colorless (unless dyed blue)	chloroform-like	liquid
Vinyl chloride	1 ppm	Ca[7]	Ca		5 ppm[11]	colorless	pleasant (at high concentrations)	gas (liquid below 56° F)
Xylenes	100 ppm	100 ppm	900 ppm	150 ppm	100 ppm	colorless	aromatic	liquid (solid below 56° F)
Semivolatile Organic Compounds:								
Benzidine	Ca[12]	Ca[7]	Ca		N.E.[11]	Grayish yellow, reddish gray, or white		crystalline powder
Benzo(a)pyrene	.2 mg/m^3	.1 mg/m^3	Ca 80 mg/m^3		.2 mg/m^3			
Bis(2-chloroethyl)ether (Dichloroethyl ether)	15 ppm	Ca 5 ppm[7]	Ca 100 ppm[8]	10 ppm	5 ppm	colorless	chlorinated solvent-like	liquid

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Semivolatile Organic Compounds (continued):								
Bis(2-ethylhexyl)phthalate (Di-sec octyl phthalate)	5 mg/m^3	Ca 5 mg/m^3[7]	Ca 5,000 mg/m^3)	10 mg/m^3	5 mg/m^3	colorless	slight	oily liquid
Chrysene	.2 mg/m^3	.1 mg/m^3	Ca 80 mg/m^3)		.2 mg/m^3			
Cresol	5 ppm	2.3 ppm	250 ppm		5 ppm	colorless, yellow, brown, or pinkish	sweet, tarry	liquid or solid
1,2-Dichlorobenzene (o-Dichlorobenzene)	50 ppm	50 ppm	200 ppm	50 ppm	25 ppm	colorless to pale yellow	pleasant, aromatic	liquid
1,4-Dichlorobenzene (p-Dichlorobenzene)	75 ppm	Ca[7]	Ca 150 ppm[8]	110 ppm	[10 ppm]	colorless or white	mothball-like	crystalline solid
Diethyl phthalate		5 mg/m^3			5 mg/m^3			
Di-n-butyl phthalate (Dibutyl phthalate)	5 mg/m^3	5 mg/m^3	4,000 mg/m^3		5 mg/m^3	colorless to faint yellow	slight aromatic	oily liquid
Isophorone	25 ppm	4 ppm	200 ppm		5 ppm[10]	colorless to white	peppermint-like	liquid
Naphthalene	10 ppm	10 ppm	250 ppm	15 ppm	10 ppm	colorless to brown	of mothballs	solid
4-Nitroaniline	6 mg/m^3	3 mg/m^3	300 mg/m^3		3 mg/m^3	bright yellow	slight ammonia-like	crystalline powder

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Semivolatile Organic Compounds (continued):								
Nitrobenzene	1 ppm	1 ppm	200 ppm		1 ppm	yellow	pungent odor like paste shoe polish	oily liquid (solid below 42° F)
Pentachlorophenol	0.5 mg/m^3	0.5 mg/m^3	215 mg/m^3		0.5 mg/m^3	colorless to white	benzene-like	crystalline solid
Phenol	5 ppm	5 ppm	250 ppm		0.5 mg/m^3	colorless to light pink	sweet, acrid	crystalline solid (liquifies by mixing with about 8 percent water)
Pesticides/Polychlorinated Biphenyls:								
Aldrin	0.25 mg/m^3	Ca 0.25 mg/m^3[7]	Ca 25 mg/m^3[8]		0.25 mg/m^3	colorless to dark brown	mild chemical	crystalline solid
Aroclor 1242 [Chlorodiphenyl (42 percent chlorine)]	1 mg/m^3	Ca 0.001 mg/m^3[7]	Ca 5 mg/m^3[8]		1 mg/m^3	colorless to light colored	mild hydrocarbon	viscous liquid
Aroclor-1254 [Chlorodiphenyl (54 percent chlorine)]	0.5 mg/m^3	Ca 0.001 mg/m^3[7]	Ca 5 mg/m^3[8]		0.5 mg/m^3	colorless to pale yellow	mild hydrocarbon	viscous liquid (solid below 50° F)
Chlordane	0.5 mg/m^3	Ca 0.5 mg/m^3[7]	Ca 100 mg/m^3[8]		0.5 mg/m^3	amber colored	pungent, chlorine-like	viscous liquid
4,4'-DDT	1 mg/m^3	0.5 mg/m^3	500 mg/m^3		1 mg/m^3			

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Semivolatile Organic Compounds (continued):								
Dieldrin	0.25 mg/m^3	Ca 0.25 mg/m^3[7]	Ca 50 mg/m^3[8]		0.25 mg/m^3	colorless to light tan	mild, chemical	crystal
Endrin	0.1 mg/m^3	0.1 mg/m^3	2 mg/m^3		0.1 mg/m^3	colorless to tan	mild, chemical	crystalline solid
Gamma-BHC (Lindane)	0.5 mg/m^3	0.5 mg/m^3	50 mg/m^3		0.5 mg/m^3	white to yellow	slight musty	crystalline powder
Inorganics:								
Aluminum (metal dust)	0.5 mg/m^3	10 mg/m^3			10 mg/m^3			
Antimony (metal)	0.5 mg/m^3	0.5 mg/m^3	50 mg/m^3		0.5 mg/m^3	silver-white, lustrous		hard, brittle solid
Arsenic	0.010 mg/m^3	Ca 0.002 mg/m^3[7]	Ca 5 mg/m^3[8]		[0.01mg/m^3]	silver-gray or tin-white	odorless	brittle solid
Barium	0.5 mg/m^3	0.5 mg/m^3	50 mg/m^3		0.01mg/m^3	white (barium nitrate and barium chloride)	odorless (barium nitrate and barium chloride)	solid (barium nitrate and barium chloride)
Beryllium (metal)	0.002 mg/m^3	Ca 0.0005 mg/m^3[7]	Ca 4 mg/m^3[8]		0.002 mg/m^3[9]	gray-white		hard, brittle solid
Cadmium (dust)	0.005 mg/m^3	Ca[7]	9 mg/m^3[8]		[0.05 mg/mg^3]	silver-white, blue-tinged, lustrous	odorless	solid

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Inorganics (continued):								
Chromium (metal)	1 mg/m^3	0.5 mg/m^3	250 mg/m^3		0.5 mg/m^3	blue-white to steel gray, lustrous		hard, brittle solid
Cobalt (metal)	0.1 mg/m^3	0.05 mg/m^3	20 mg/m^3		[0.05 mg/m^3]	silver-gray to black	odorless	solid
Copper (dust)	1 mg/m^3	1 mg/m^3	100 mg/m^3		1 mg/m^3	reddish, lustrous	odorless	malleable solid
Cyanides	5 mg/m^3	5 mg/m^3	25 mg/m^3		5 mg/m^3	white	faint almond-like	granular or crystalline solids
Hydrogen cyanide	10 ppm	4.7 ppm	50 ppm	4.7 ppm	10 ppm[10]	colorless or pale blue	bitter, almond-like	liquid (gas above 78° F)
Lead (metal)	0.05 mg/m^3	0.05 mg/m^3	100 mg/m^3		0.15 mg/m^3	soft gray		heavy, ductile solid
Manganese	5 mg/m^3	1 mg/m^3	500 mg/m^3	1 mg/m^3	[5 mg/m^3]	lustrous, silvery		brittle solid
Mercury (vapor)	0.1 mg/m^3	0.05 mg/m^3	10 mg/m^3		0.05 mg/m^3	silver-white	odorless	heavy liquid
Nickel (metal)	1 mg/m^3	Ca 0.015 mg/m^3[7]	Ca 10 mg/m^3		[1 mg/m^3]	lustrous, silvery		solid
Selenium	0.2 mg/m^3	0.2 mg/m^3	10 mg/m^3		0.2 mg/m^3	red to gray		crystalline solid
Silver (metal dust)	0.01 mg/m^3	0.01 mg/m^3	10 mg/m^3		0.1 mg/m^3	white, lustrous		solid

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

Compound	OSHA PEL[2]	NIOSH REL[3]	IDLH[4]	STEL[5]	TLV[6]	Recognition Qualities		
						Color	Odor	State
Inorganics (continued):								
Thallium	0.1 mg/m^3	0.1 mg/m^3	15 mg/m^3		0.1 mg/m^3	varies	varies	varies
Tin	2 mg/m^3	2 mg/m^3	100 mg/m^3		2 mg/m^3	gray to almost silver-white, lustrous		malleable solid

Sources:

1.U.S. Department of Health and Human Services, Public Health Service, *NIOSH Website, November 2003.*

Notes:

[1]No information is provided in the sources for 41 of the 109 compounds detected at the site. Complete lists of the compounds detected at each site are presented in Tables 1-3 and 1-4.

[2]Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) are time-weighted average (TWA) concentrations that must not be exceeded during any eight-hour work shift of a 40-hour week.

[3]National Institute for Occupational Safety and Health (NIOSH) recommended exposure limits (RELs) are TWA concentrations for up to a 10-hour workday during a 40-hour workweek.

[4]Immediately Dangerous to Life or Health (IDLH) concentrations represent the maximum concentrations from which a person could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

[5]A short-term exposure limit (STEL) is a 15-minute TWA exposure that should not be exceeded at any time during the workday.

[6]A threshold limit value (TLV), as published by the American Conference of Governmental Industrial Hygienists (ACGIH), is an eight-hour TWA exposure limit.

TABLE 4-1 – (UPDATED NOVEMBER 2003)

EXPOSURE LIMITS AND RECOGNITION QUALITIES[1]
MIDCO I AND II SITES
GARY, INDIANA

[7]NIOSH-identified occupational carcinogen - reduce exposure to lowest feasible concentration.

[8]The IDLH concentration or designation shown after Ca was determined in the NIOSH Standards Completion Program, and carcinogenic effects were not considered.

[9] Suspected human carcinogen according to the ACGIH.

[10]Ceiling value that should not be exceeded at any time.

[11]Confined human carcinogen according to the ACGIH.

[12]OSHA-regulated carcinogen - exposure must be controlled through the required use of engineering controls, work practices, and personal protective equipment.

Key:

Blank space	= No information available in the source material.
N.E.	= Not established.
Ca	= Potential human carcinogen.
[]	= Quantitation proposed to be changed.

Appendix J

M/I SPEC 003

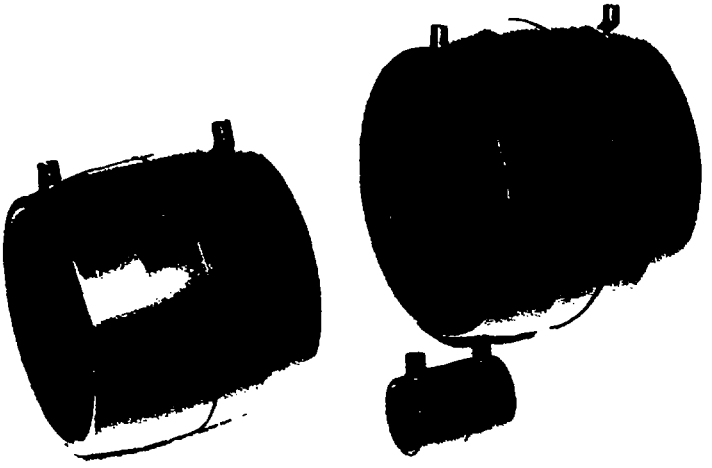
ELECTROFUSION COUPLINGS

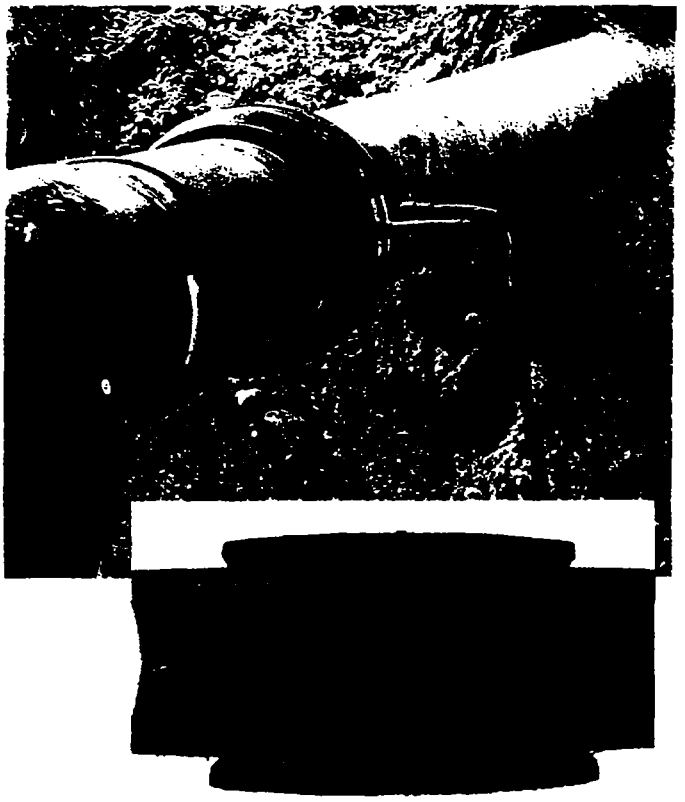
Solves the Problem of Difficult Connections

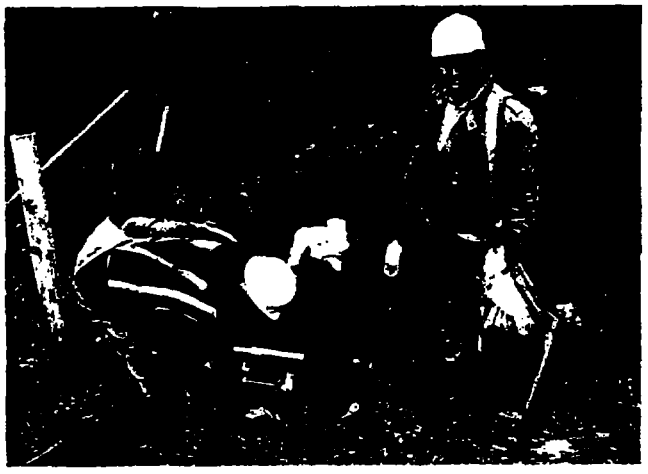
Features

- **Engineered For Use On HDPE Pipe**
- **Size Range 1/2"CTS - 12"IPS**
- **Pressure Rated Up To 160 psi**
- **PE3408 Resin Complies With ASTM D3350**
- **NSF Listed Resin**
- **Meets AWWA C906**
- **FM Approved**
- **Complies With ASTM F1055**
- **Quick and Easy Installation**
- **Needs No Cumbersome Equipment**

Made in U.S.A.







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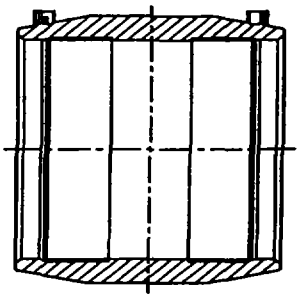
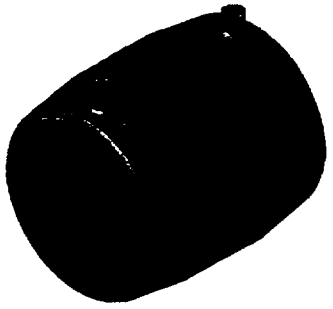
Michigan Pipe Supply, LLC
P.O. Box 442
Mount Pleasant, MI 48804-0442

989-772-2225 FAX 989-772-0495





1/2" CTS	1 1/4" SIDR9 DUCT	4" IPS
3/4" CTS	1 1/2" IPS	6" IPS
1" CTS	2 "IPS CONDUIT	8" IPS
1 1/4" DUCT	3" IPS	12" 1PS

Related Specifications

- ASTM D2513
- ASTM F1055
- ASTM D1598
- AWWA C906
- ASTM D3350
- ASTM D1599

Fitting Requirements

These electrofusion fittings are designed and manufactured in accordance with ASTM Specifications F-1055 for use with pipe conforming to ASTM D2513/3035, F-714 and with Butt fittings conforming to ASTM D3261. Electrofusion fittings can be tested and supplied in accordance with AWWA C906 specification.

These fittings can be supplied with an integral identification resistor which is recognized by all Central Plastic's processors to automatically set the proper fusion parameters. Electrofusion fittings are supplied with a 24 digit ISO recognized barcode label which facilitates the fusion of the Central Plastic electrofusion fitting with other manufactures processors.

These electrofusion fittings are produced from a PE3408 grade of polyethylene resin which complies with ASTM specifications D3350. The pre-blended virgin resin has a PPI listing of 3408 that meets or exceeds the requirements of NSF Standard 61.

Required Testing

1. **Minimum Hydraulic Burst Pressure Test. (ASTM D1599)**
2. **Sustained Pressure Test Results. (ASTMD 1598)**
   Must exceed 170 hours in 80°C bath at 670 psi hoop stress (134 psig) or exceed 1000 hours in 80°C bath at 580 psi hoop stress (116 psig) (all above criteria are equivalent.)
3. **Tensile Strength Test.**
   Pipe elongation in excess of 25 % without separation from electrofusion coupling
4. **Joint Integrity Test.**
   Crush test of pipe without separation from electrofusion coupling.

ISO 9001 CERTIFIED

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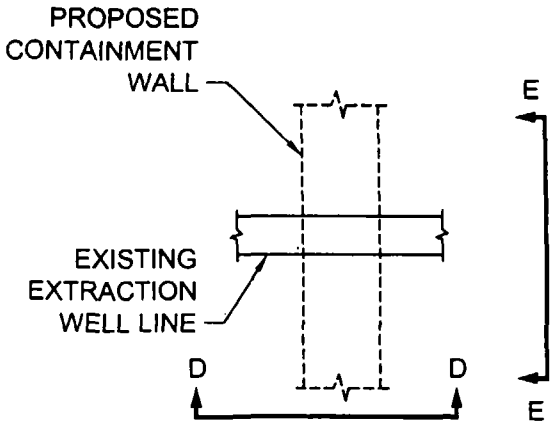
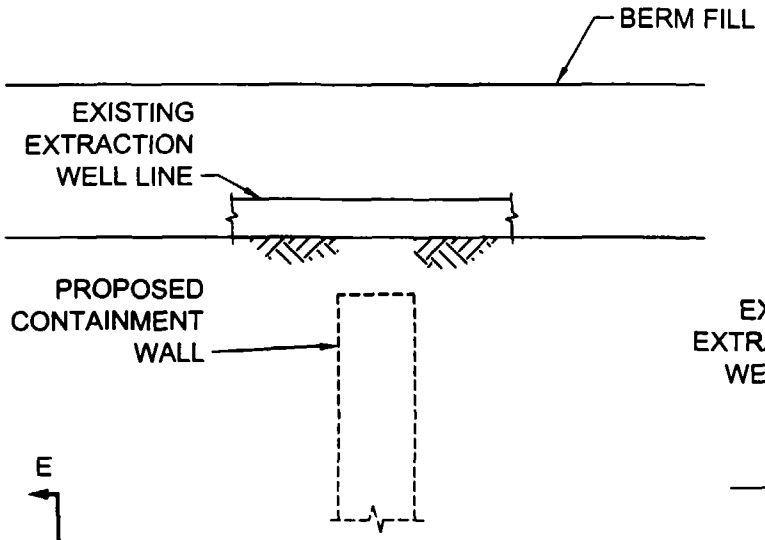
405-273-5993

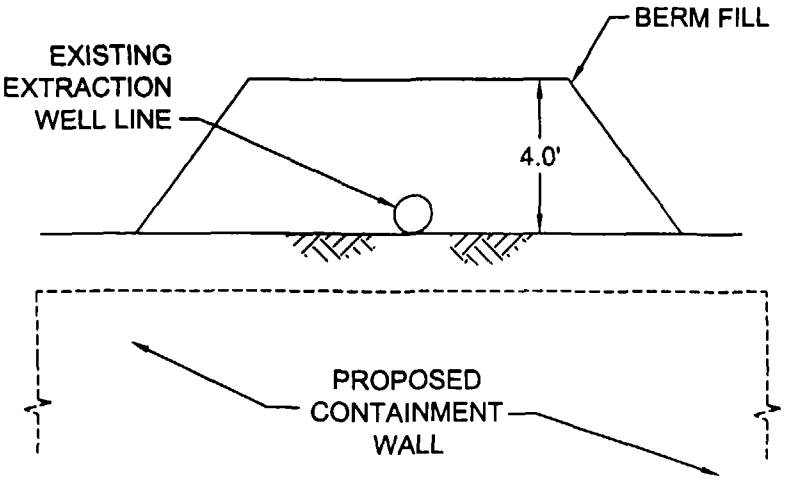
EXTRACTION WELL LINE AT EW-5 CROSSING DETAILS AND CONSTRUCTION SEQUENCE



EXISTING CONDITION
PLAN VIEW
SCALE: 1" = 5'

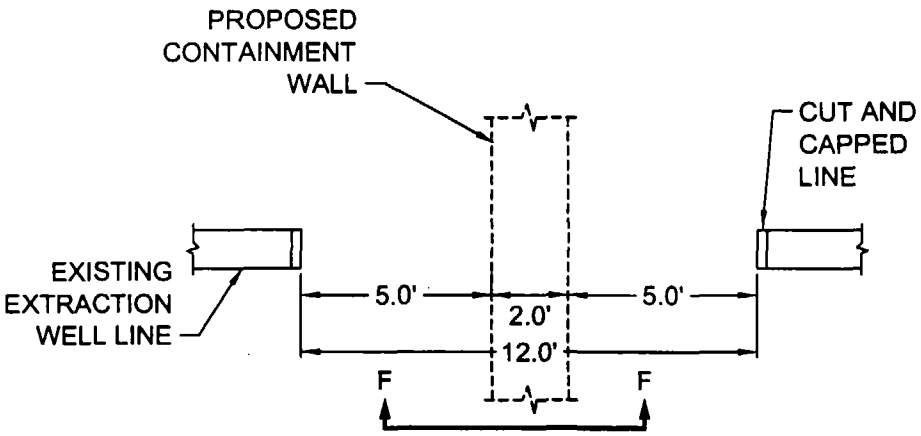


EXISTING CONDITION
SECTION D-D
SCALE: 1" = 5'



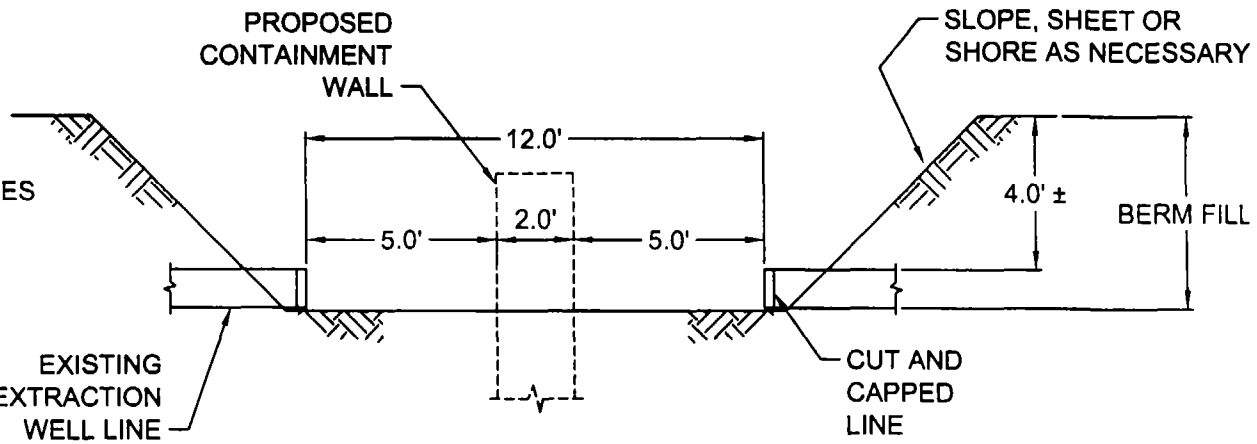
EXISTING CONDITION
SECTION E-E
SCALE: 1" = 5'

EXTRACTION WELL LINE AT EW-5 CROSSING DETAILS AND CONSTRUCTION SEQUENCE



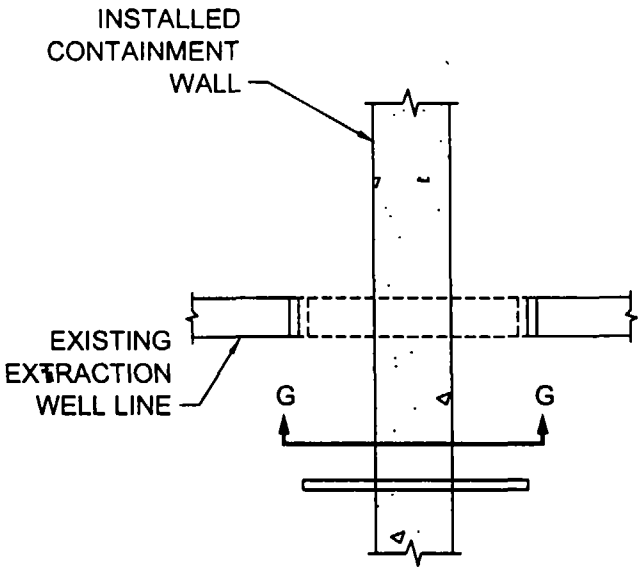
EXCAVATE AND CUT/CAP EXISTING LINES
PLAN VIEW
SCALE: 1" = 5'

NOTE: AFTER CAPPING OF EXISTING WELLS, BACKFILL AND INSTALL CONTAINMENT WALL.

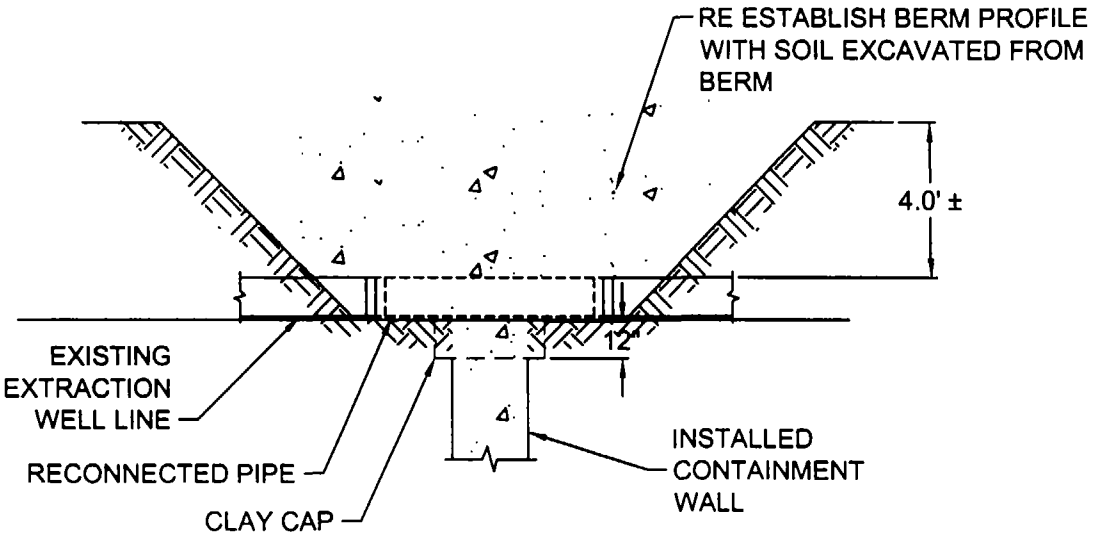


EXCAVATE AND CUT/CAP EXISTING LINES
SECTION F-F
SCALE: 1" = 5'

EXTRACTION WELL LINE AT EW-5 CROSSING DETAILS AND CONSTRUCTION SEQUENCE



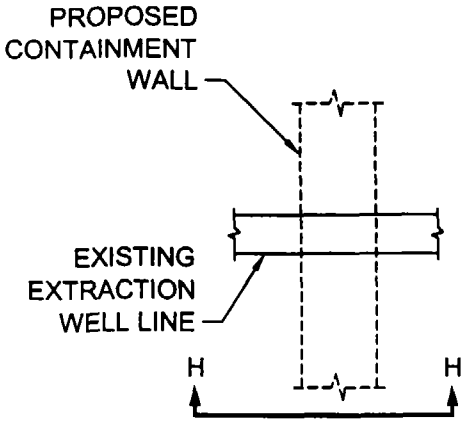
RECONNECTION OF EXISTING LINES
AND BACKFILL WITH SOIL-BENTONITE SLURRY
PLAN VIEW
SCALE: 1" = 5'



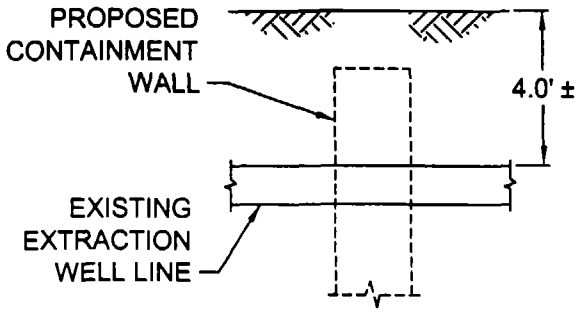
RECONNECTION OF EXISTING LINES
AND BACKFILL WITH SOIL-BENTONITE SLURRY
SECTION G-G
SCALE: 1" = 5'

NOTE: ESTABLISH CONNECTION DEPENDENT UPON TYPE OF PIPE. ELECTROFUSION COUPLING FOR HDPE PIPE OR MECHANICAL CONNECTION FOR STEEL PIPE WRAPPED WITH HDPE TAPE.

EXTRACTION WELL LINE AT EW-3 CROSSING DETAILS AND CONSTRUCTION SEQUENCE

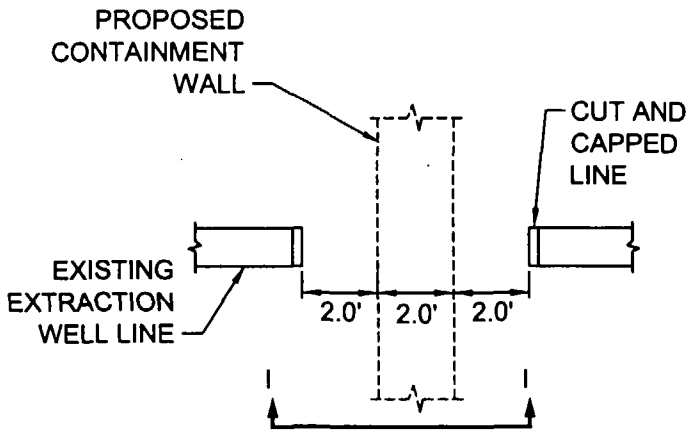


EXISTING CONDITION
PLAN VIEW
SCALE: 1" = 5'

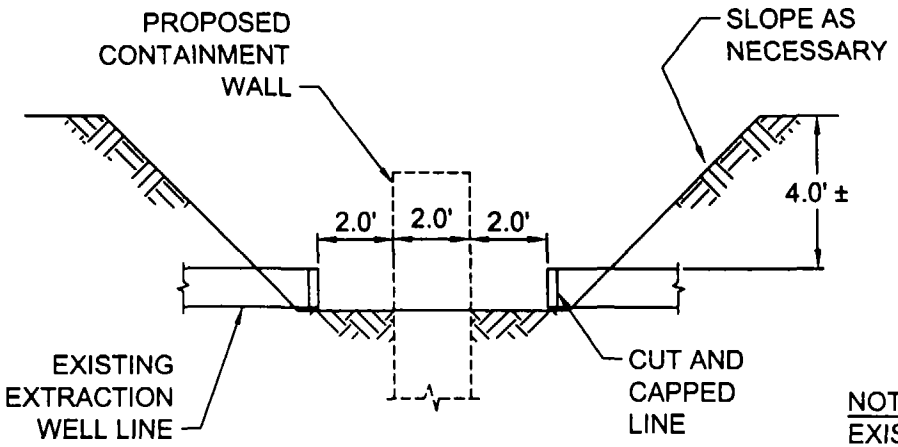


EXISTING CONDITION
SECTION H-H
SCALE: 1" = 5'

EXTRACTION WELL LINE AT EW-3 CROSSING DETAILS AND CONSTRUCTION SEQUENCE



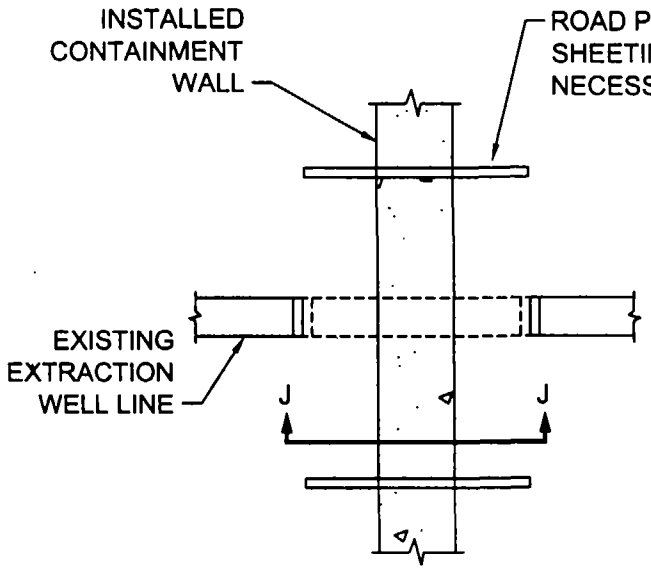
EXCAVATE AND CUT/CAP EXISTING LINES
PLAN VIEW
SCALE: 1" = 5'



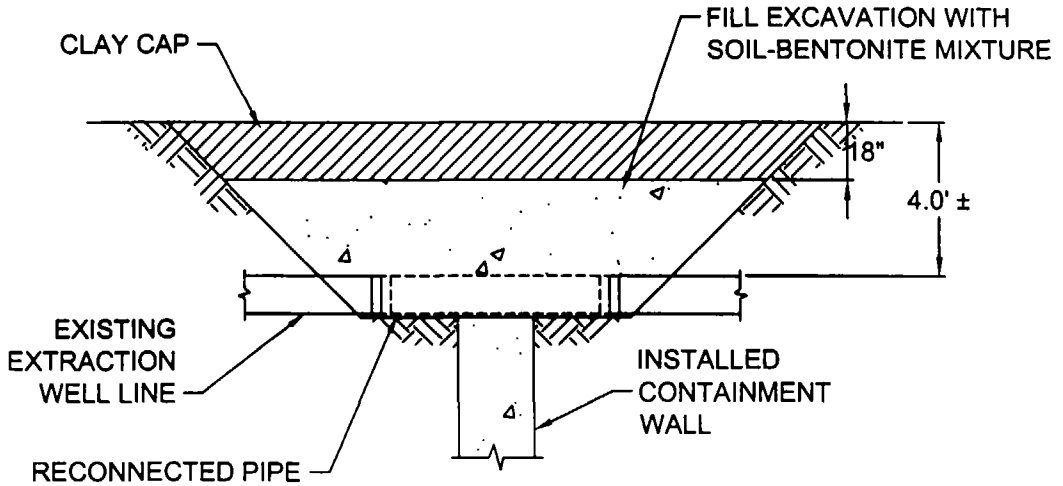
EXCAVATE AND CUT/CAP EXISTING LINES
SECTION I-I
SCALE: 1" = 5'

NOTE: AFTER CAPPING OF EXISTING WELLS, BACKFILL AND INSTALL CONTAINMENT WALL.

EXTRACTION WELL LINE AT EW-3 CROSSING DETAILS AND CONSTRUCTION SEQUENCE

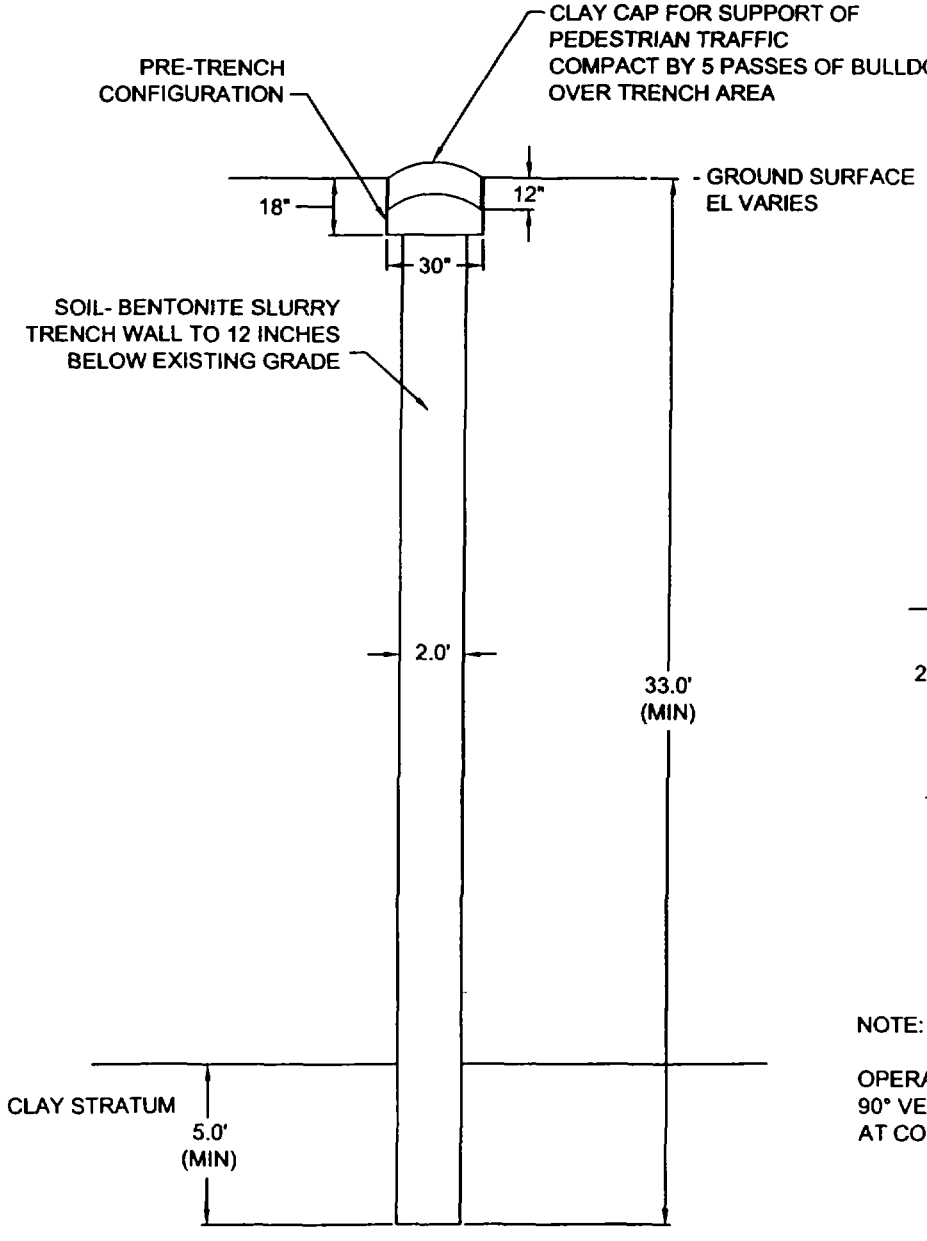


RECONNECTION OF EXISTING LINES
AND BACKFILL WITH SOIL-BENTONITE SLURRY
PLAN VIEW
SCALE: 1" = 5'

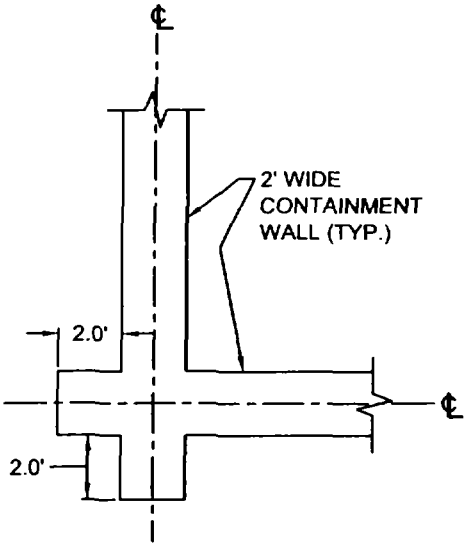


RECONNECTION OF EXISTING LINES
AND BACKFILL WITH SOIL-BENTONITE SLURRY
SECTION J-J
SCALE: 1" = 5'

NOTE: ESTABLISH CONNECTION DEPENDENT UPON TYPE OF PIPE. ELECTROFUSION COUPLING FOR HDPE PIPE OR MECHANICAL CONNECTION FOR STEEL PIPE WRAPPED WITH HDPE TAPE.



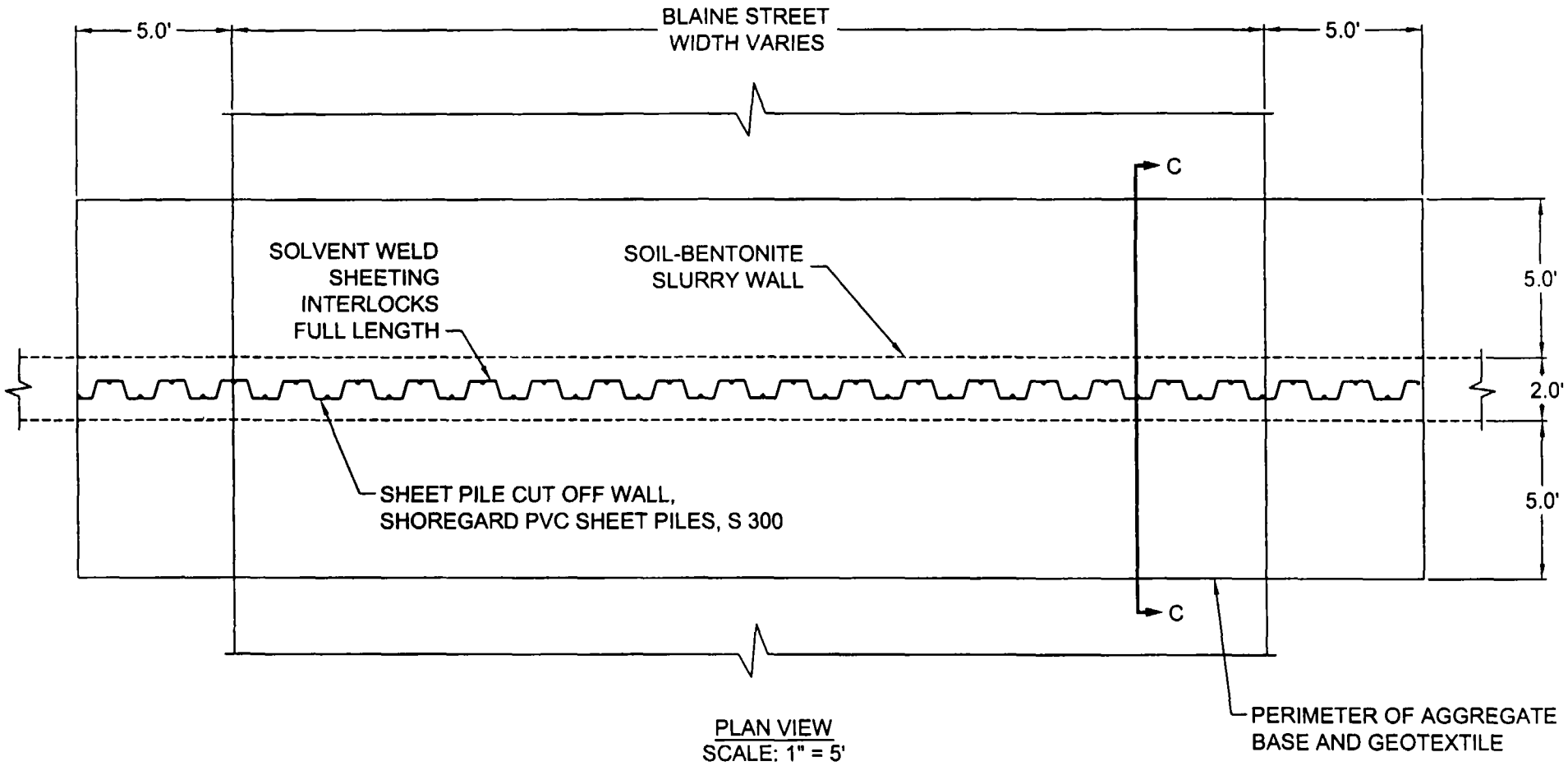
SECTION A-A
TYPICAL SOIL- BENTONITE SLURRY WALL SECTION
SCALE: 1" = 6'



TYPICAL CORNER DETAIL
SCALE: 1" = 12'

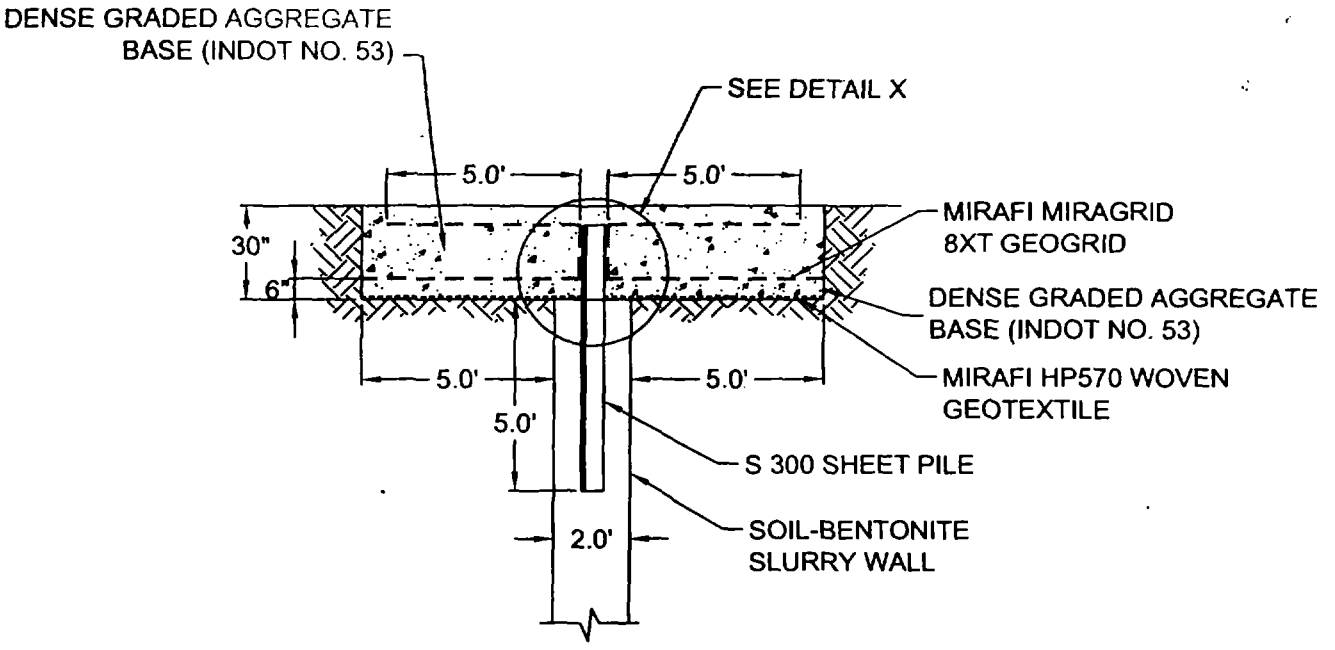
NOTE:

OPERATE TRENCHER AT
90° VERTICAL ORIENTATION
AT CORNERS

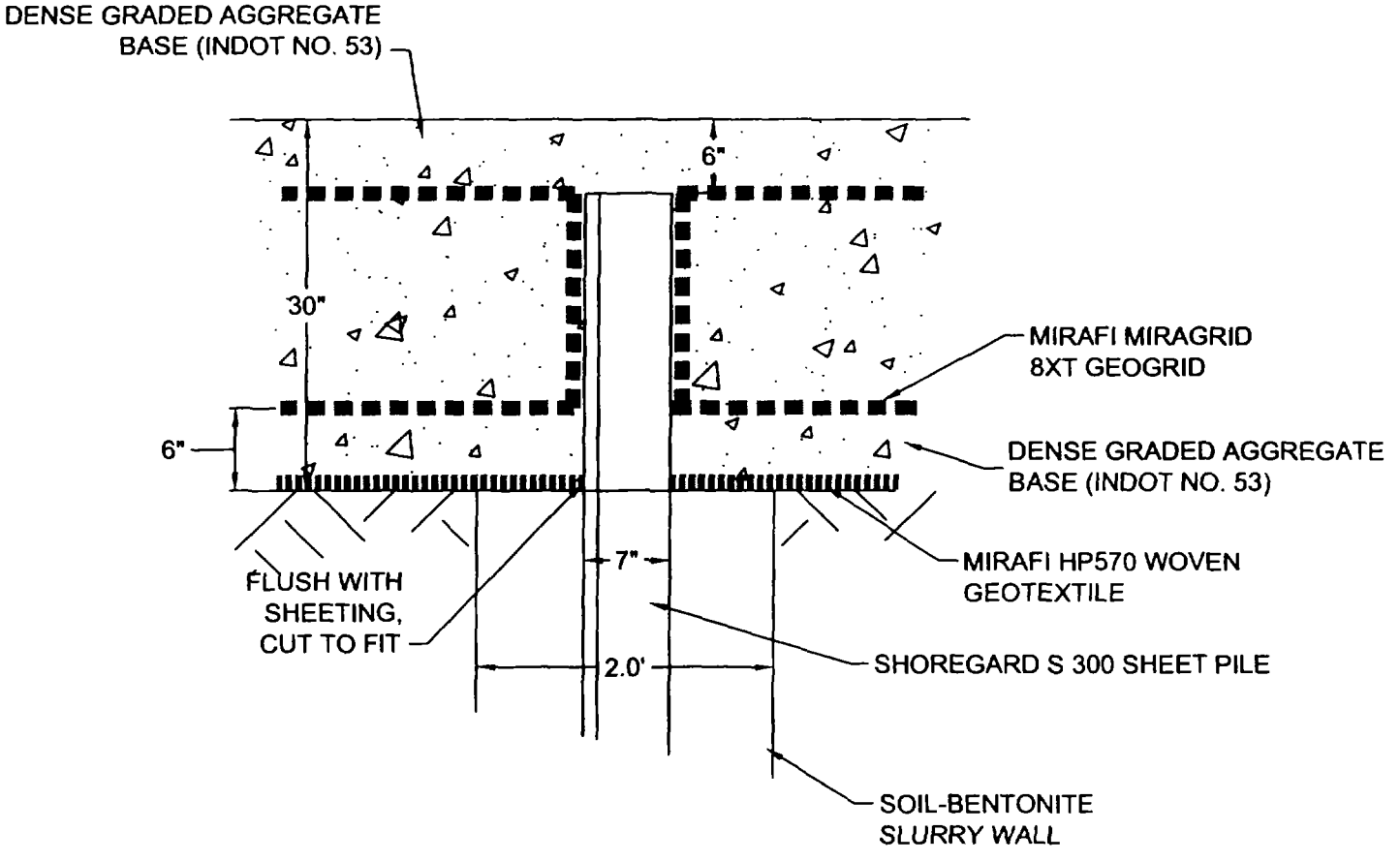


PLAN VIEW
SCALE: 1" = 5'

ROAD CROSSING DETAILS
PAGE 1 OF 2

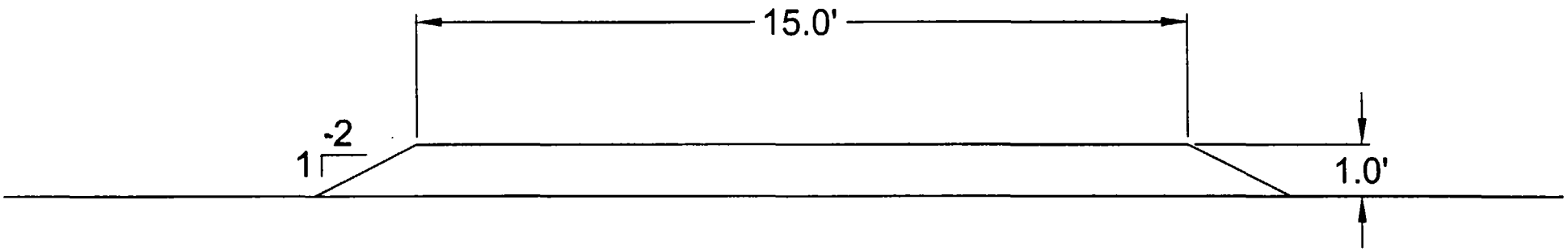


SECTION C-C
SCALE: 1" = 5'



DETAIL X
SCALE: NONE

ROAD CROSSING DETAILS
PAGE 2 OF 2



SECTION B-B WORKING PLATFORM DETAIL
SCALE: 1" = 3'

Appendix K

Specifications for Soil- Bentonite Containment Barrier Wall

Part 1 General

1.1 Scope

A. The scope of this specification includes all materials, equipment and personnel required to construct a vertical containment barrier wall along the alignment shown on Drawing 02144-011 A. The purpose of this work is to construct a soil-bentonite cutoff wall extending from the ground surface to a minimum of 5 feet below the surface of an appropriate key-in material. The key-in material shall be a silty clay deposit is approximately 27 to 28 feet below the existing ground surface (approximately elevation 566 to 570 NGVD). The containment barrier wall (CBW) is to be constructed using a one pass trencher capable of thoroughly blending a soil - water -bentonite into a uniform mixture. The final soil-bentonite mix is to contain 4 pounds of bentonite by dry weight 100 pounds of dry weight of trench soil.

Part 2 Materials

2.1 Bentonite

A. Along the east wall of the containment barrier the bentonite material shall consist of Hydrogel 90 as manufactured by Wyo-Ben, Inc.

B. Along the north, south, and west walls of the containment barrier the bentonite material shall consist of SW-101 as manufactured by Wyo-Ben, Inc.

2.2 Water

A. Water shall be potable.

2.3 Soil

A. Soil shall be existing, in place materials free of refuse and debris.

Part 3 Equipment

3.1 Equipment

A. Trencher -The trencher equipment used to construct the Containment Barrier wall shall be a one pass chain trencher with a minimum excavation width of 24 inches. The trencher shall be self-propelled and capable of continually rotating the trencher chain so that full and continuous mixing of the soil-water-bentonite mix may occur over the full depth of the excavation.

Specifications for Soil- Bentonite Containment Barrier Wall

B. Slurry mixing and distribution system -The slurry mixing and distribution system shall be capable of uniformly mixing and maintaining in a mixed state the water-bentonite slurry.

C. During freezing weather, provide tank heaters or continuous circulations systems to keep the water-bentonite slurry from freezing.

Part 4 Execution

4.1 Execution

A. Layout CBW alignment and excavate a shallow pre-trench along the alignment.

B. Place required measured weight of dry bentonite into pre-trench.

C. Insert Trencher and mix soil-water-bentonite until uniform mix is formed.

D. Begin travel with trencher, control rate to achieve continuous, uniform soil-bentonite mixture with a slump in the range of 4 to 8 inches.

4.2 Terminations

A. The initial containment wall shall begin and end 2 feet beyond the outermost edge of the walls that are perpendicular to the initial containment wall.

B. At the end of a containment wall that ties into a previously constructed containment wall, the new wall is to extend 2 feet beyond the beyond the exterior edge of the previously constructed wall.

Part 5 Quality Control

5.1 Quality Control

A. Perform quality control in accordance with the contractors approved Construction Quality Control (CQC) program.