GWOU ADMINISTRATIVE RECORD
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WELDON SPRING SITE REMEDIAL ACTION PROJECT
MK-FERGUSON CO., INC. WO 3589 (314) 441-8086
7295 Highway 94 South
St. Charles, MO 63304

Document Number: 84062

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Originators DCN: 3840-C:GE-N05-4811-0

▸▸SUBJECT GROUNDWATER OPERABLE UNIT SOIL SAMPLING REPORT

▸▸AUTHOR DILLE, J.C. ▸▸TO WESELY, MARJ ▸▸DATE 06/21/99

▸▸SUBJECT CODE/WORK PACKAGE NUMBER 2i 6010 496

REFERENCED DOCUMENT(S) _____

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84062 Page 1 of 1

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DOCUMENT NO.	W.P. NO.	TASK NO.	DATE
3840-C:GE-N-05-4811-00	476	852	6/18/99

TO:

WSSRAP
7295 Highway 94 South
St. Charles, Missouri 63304
(314) 441-8086

Attn: M. Wesely/R. Cato

FROM:

Engineering, Construction
& Environmental Group
P.O. Box 73
Boise, ID 83729

Attn: J. Carl Dille

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cc: Task File
P. Patchin
K. Nanney *

REMARKS/INSTRUCTIONS:

N/A

Prepared By: Carol Montgomery Carol Montgomery

Approved By: J. Carl Dille clm for J. Carl Dille

Title: Off-Site Design Manager

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WSSRA PROJECT DOCUMENT TRANSMITTAL FORM

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3840TM-5031 3840-C:GE-K-05-4810	0	1	Groundwater Operable Unit Soil Sampling Report	A

DISTRIBUTION: * Transmittal Only

cc: Task File
P. Patchin
K. Nanney *

REMARKS/INSTRUCTIONS:

N/A

Prepared By:
Carol Montgomery Carol Montgomery

Approved By:
J. Carl Dille Clm for J. Carl Dille

Title:
Off-Site Design Manager

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Morrison Knudsen Corporation
Engineers and Constructors Group

WSSRA PROJECT REVIEWS AND APPROVALS

W.P. NO. 476 TASK NO. 852 DOC. NO. 3840-C: GE-K-05-4810-00

W.P. TITLE: Quarry Restoration QUALITY LEVEL 2

LEAD DISCIPLINE Geology

SUBJECT: WSSRAP – Groundwater Operable Unit
Soil Sampling Report
Report – Rev. 0
Technical Memorandum
No. 3840TM-5031-00

	PRINT/TYPE NAME	SIGNATURE	DATE
PREPARED:	P. Patchin	Paul C Patchin	6/15/99
REVIEWED:	A. Benfer	A Benfer	6/15/99
APPROVED MK E&C:			
- LEAD TASK ENGINEER	P. Patchin	Paul C Patchin	6/15/99
- LEAD DISCIPLINE DEPT. MGR.	R. Raymondi	Phil Raymondi	6/15/99
- DESIGN MANAGER	J. C. Dille	John Bessant for JCD	6-16-99
- ENGINEERING MANAGER	M. Tavelli	[signature]	6/17/99
APPROVED:			
- OFF-SITE QUALITY MANAGER	M. Maier	M J Maier	6/17/99

WELDON SPRING SITE REMEDIAL ACTION PROJECT

WSSRAP GROUNDWATER OPERABLE UNIT (GWOU) SOIL SAMPLING REPORT

Task 852

Technical Memorandum No. 3840TM-5031-00

June 1999

Rev. 0

Prepared By

Morrison Knudsen Corporation
Engineers and Constructors Group
720 Park Boulevard
Boise, ID 83729

for

MK-Ferguson Group
7295 Highway 94 South
St. Charles, MO 63304

WSSRAP
Chemical Plant
Technical Memorandum No. 3840TM-5031-00
Task No. 852
GWOU Soil Sampling Report

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ATTACHMENTS

- Borehole Logs

1.0 Introduction

This memorandum describes the soil sampling activities performed as part of the RI/FS process for the Groundwater Operable Unit at the WSSRAP. Field studies were conducted in the temporary storage area (TSA) from February 3rd through February 19th, 1999. During that period, thirty-two boreholes were drilled and sampled. The work was generally performed as described in the *Sampling Plan for the Remedial Investigation/Feasibility Study for the Groundwater Operable Unit at the Chemical Plant and Ordnance Works – Addendum 4: Soil Sampling for TCE at the Chemical Plant,* (MKF&JEG, 1999). As stated in the plan, the objectives of this investigation were to:

- Identify the source of PCE and TCE contamination to the shallow aquifer beneath the chemical plant
- Delineate the vertical and horizontal extent of PCE and TCE soil contamination if a source area is identified.

Geotechnology Inc. was subcontracted to perform all drilling, sampling, and borehole abandonment as part of Work Package 476, Task 15.

2.0 Environmental Safety and Health

The drilling was performed in accordance with the subcontractor's safe work plan under the authority of the PMC site health and safety plan. PMC safety representatives performed an initial safety inspection of the subcontractor's drill rig and provided coverage throughout the fieldwork. Work was performed in modified Level C personal protective equipment consisting of poly-coated Tyveck® coveralls, latex gloves, steel-toed boots, safety glasses, and hard hats. Non-drilling personnel wore fluorescent safety vests. No safety-related incidents or accidents occurred during this investigation.

ES&H personnel provided constant coverage during the fieldwork. All soil samples retrieved during drilling were scanned for beta and gamma activity before leaving the work area.

3.0 Waste Management

Soil cuttings generated from the drilling and sampling within the TSA fence were not collected because additional excavation of contaminated soil within the area was planned. Other waste generated during the drilling inside the TSA such as personal protective equipment was bagged and disposed of as radioactive trash. For those boreholes drilled outside the TSA fence, the cuttings were collected and contained in lined 55-gallon drums and transported to the Ash Pond area and emptied. All other waste generated outside the TSA was disposed of as clean waste.

4.0 Drilling and Sampling

A total of 32 boreholes were drilled in six areas of the temporary storage area (TSA). Four borings that were originally planned for the south end of raffinate pit 4 were not drilled following reevaluation of sampling data which showed PCBs in the area. It was determined that PCB decontamination requirements would significantly delay a subsurface investigation here, therefore, sampling was not conducted. Collection of samples from this area will likely be performed at a later date.

The investigation boreholes were drilled at locations shown in the *Sampling Plan* except where access to the original location was limited. In this case, the borehole was moved the minimum distance (less than 25 feet) from the original location. Figure 1 shows the final locations of the TCE soil sampling boreholes in the TSA vicinity. Monitoring wells and previous soil gas sampling locations are also shown. Table 4-1 below is a summary of the boreholes drilled during this program.

Table 4-1 Borehole Summary Table				
Borehole ID	**Northing[1]**	**Easting[1]**	**Ground Elevation[2]**	**Total Depth (ft.)[3]**
TSA1-1	1042160.70	753592.60	666.56	49.0
TSA1-2	1042132.60	753543.84	664.29	45.0
TSA1-3	1042120.01	753456.60	665.56	48.5
TSA1-4	1042078.35	753618.52	663.90	45.5
TSA1-5	1042019.31	753455.53	659.02	33.0
TSA1-6	1042043.73	753555.03	662.51	38.0
TSA1-7	1041970.78	753568.11	661.84	39.5
TSA1-8	1041899.53	753481.25	653.25	32.5
TSA2-1	1041778.19	753479.33	654.15	26.5
TSA2-2	1041732.92	753486.52	656.06	27.5
TSA2-3	1041667.71	753480.84	656.27	34.0
TSA2-4	1041619.59	753483.70	658.12	37.5
TSA3-1	1041461.85	753480.41	656.11	30.0
TSA3-2	1041481.03	753620.27	662.39	32.0
TSA3-3	1041405.31	753555.52	665.00	42.5
TSA3-4	1041328.06	753483.40	657.06	37.0
TSA3-5	1041353.87	753646.26	665.63	31.5
TSA3-6	1041262.41	753537.09	660.85	28.0
TSA3-7	1041265.30	753645.58	664.54	37.0
TSA3-8	1041321.03	753708.15	666.95	31.0
TSA4-1	1041992.53	753941.03	664.25	45.5
TSA4-2	1041937.33	753876.70	661.34	39.0
TSA5-1	1041575.34	753828.02	660.53	28.5
TSA5-2	1041471.95	753832.04	662.20	30.0
TSA5-3	1041339.66	753831.92	666.26	35.0
TSA5-4	1041255.53	753858.47	671.62	40.0
TSA6-1	1041500.75	753936.36	665.39	35.5
TSA6-2	1041449.67	753928.54	664.80	34.5
TSA6-3	1041409.04	753933.60	664.25	35.5
TSA6-4	1041399.07	753943.61	664.48	35.5
TSA6-5	1041322.18	753933.63	666.59	28.0[4]
TSA6-6	1041316.97	753934.44	667.15	36.0

[1] NAD 1983 survey datum.
[2] In feet above sea level.
[3] Total depth at the top of bedrock.
[4] Total depth above bedrock because of stuck sampler.

Two drilling rigs were used to expedite the investigation. A truck-mounted CME-75 was initially used to drill and sample the boreholes. It was joined by an all-terrain CME-550 drill rig. Hollow stem augers with an inside diameter (ID) of 4-¼-inches and outside diameter (OD) of 8-¼-inches were used on both rigs. Soil samples were collected continuously throughout each borehole using a CME continuous soil sampler with an ID of 3 inches.

Soils were retrieved from the sampler and divided into 2-½-foot samples. Each section was split lengthwise and approximately one-quarter of the sample was immediately placed and sealed in a plastic bag and the remaining three-quarters was described by the PMC geologist according to

the Unified Soil Classification System and ES&H procedure 4.4.7. The bagged samples were later screened for volatile organic compounds in the headspace as described in Section 4.1.

All boreholes except one were advanced to the top of bedrock to characterize and sample the overburden soil. Borehole TSA6-5 was terminated at 28 ft. because the CME-sampler became stuck in the augers. After repeated attempts to remove the sampler, the augers were withdrawn from the hole, the sampler retrieved, and the hole was abandoned by grouting. Borehole TSA3-3 had to be re-drilled a few feet away from the original location after poor sample recoveries were caused by a wood piece plugging the auger bit. The re-drilled hole successfully reached bedrock with good sample recoveries.

4.1 Headspace and Laboratory Sampling

Headspace screening for volatile organic compounds was conducted on each 2-½ ft. soil sample collected during this investigation. A photoionization detector (PID) with a lamp suitable for ionizing the compounds TCE and PCE was used during the headspace screening. Results from this screening will be published in an upcoming completion report.

The *Sampling Plan* stated that those samples registering at least five times the levels measured in the atmosphere during PID screening would be selected for laboratory analysis. No sample obtained during the field effort registered this high. Therefore, those samples with any noticeably higher reading than background were selected for laboratory analysis. If headspace screening showed no samples greater than background, the top 5 feet of soil from the borehole was sent for laboratory analysis. Sampled intervals and results from headspace screening and laboratory analysis will be published in the completion report.

4.2 Borehole Abandonment

Each borehole was abandoned according to the work package specifications and Missouri well construction rules. When drilling was completed, a tremie pipe was placed to the bottom of the hole and the borehole was grouted to the surface using Grout Well® high solids bentonite grout. Each borehole was checked for grout settlement and topped off as necessary.

5.0 Data Analysis

5.1 Soils

Soils sampled during the drilling effort were relatively consistent across the TSA. Recent fill material related to the construction of the TSA was encountered in a majority of the boreholes ranging up to 13 ft. deep. The thickest areas of recent fill were seen in Area 1. The recent fill was characterized primarily as re-worked Ferrelview Formation clay with its distinctive high plasticity and mottled colors. Pre-TSA fill material placed during the construction of the chemical plant was also encountered in most of the areas, sometimes beneath the recent fill. It

ranged in thickness up to 6 ft. and was distinguishable as a dark colored, low plasticity, siltier material.

The native soil stratigraphy in the chemical plant area is described in detail in the *GWOU Remedial Investigation Report* (MKF-JEG, 1997). Native soils encountered beneath the fill were consistent with previous drilling in this area of the Chemical Plant. The Ferrelview Formation, a high plasticity clay, was commonly found beneath the fill or at the ground surface at thickness' from 8 to 21.5 feet. In a few areas, the Roxana Silt, which overlies the Ferrelview, was described and where identified, it ranged in thickness from 2 to 9 feet. Below the Ferrelview Formation was the clay till unit, which ranged in thickness from 7 to 21.5 feet. A subunit of the clay till, the basal till was described in a two of the boreholes. Beneath the clay till and directly above the bedrock surface, the residuum unit was usually encountered prior to auger refusal on the bedrock, however, some boreholes showed no discernable residuum soil. Overall, this unit was generally thin in comparison with other areas on the site, ranging in thickness from 1.5 to 10.5 feet.

5.2 Bedrock

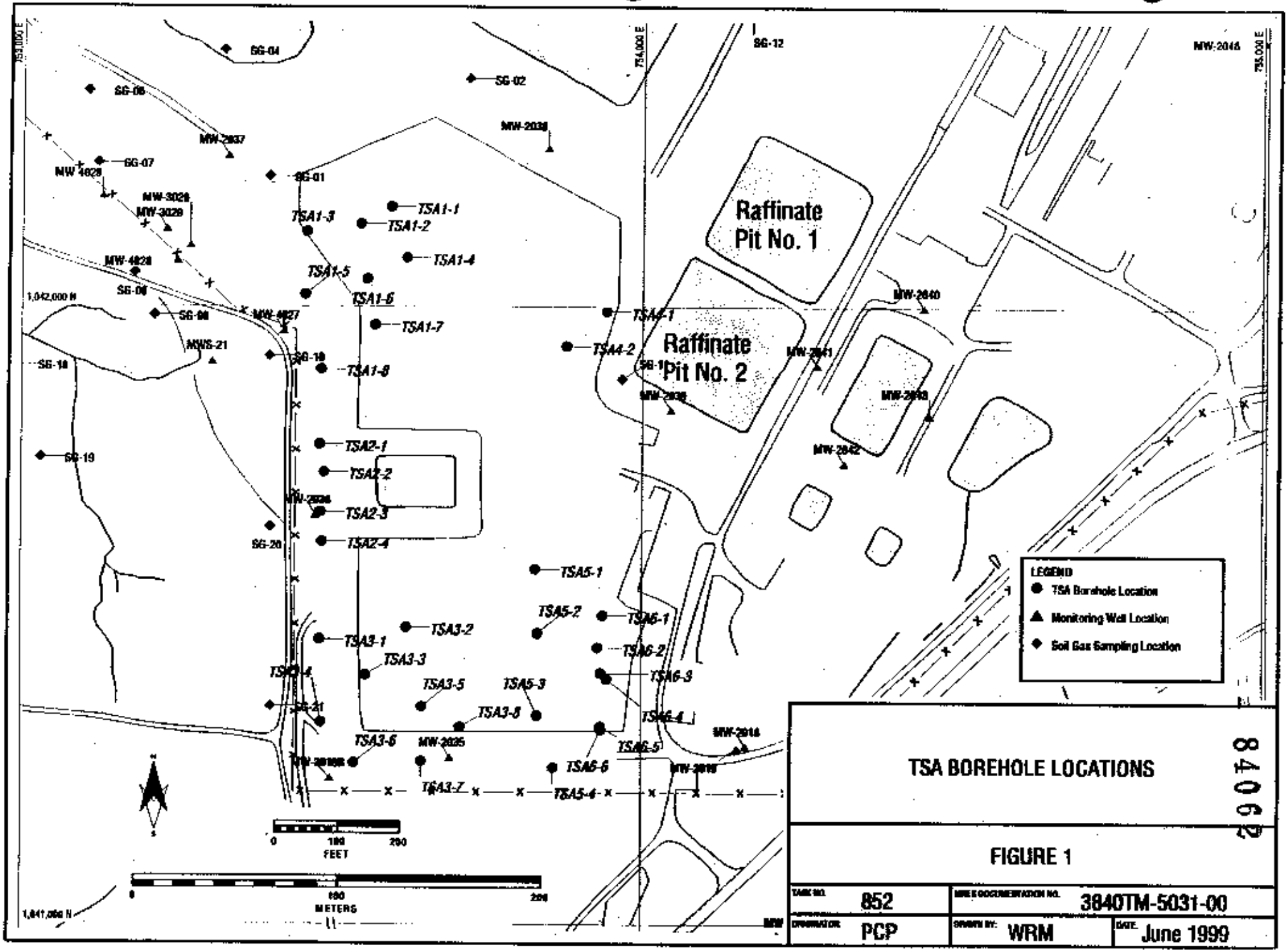
The weathered surface of the Burlington-Keokuk Limestone was encountered in the majority of the boreholes drilled in the TSA area. Auger and sampler refusal generally indicated that the bedrock surface had been intercepted. However, because of the cobble and boulder-sized rock fragments commonly found at the base of the clay till unit or within the residuum overlying the bedrock, sampler refusal did not always indicate the top of the bedrock. In some cases, an SPT sampler was driven to confirm the top of bedrock.

Figure 2 shows the bedrock topography after incorporating borehole data from the TSA area and recent drilling performed within Raffinate Pit #3. The most notable effect when compared to previous mapping is the greater definition on the bedrock surface in the TSA area. No significant changes to the overall morphology of the bedrock are noted.

6.0 References

MK-Ferguson Company and Jacobs Engineering Group. *Sampling Plan for the Remedial Investigation/Feasibility Study for the Groundwater Operable Unit at the Chemical Plant and Ordnance Works – Addendum 4: Soil Sampling for TCE at the Chemical Plant,* DOE/OR/21548-445: 4, Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. January, 1999.

MK-Ferguson Company and Jacobs Engineering Group. *Remedial Investigation for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri,* DOE/OR/21548-571 (Final), Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. July, 1997.



TSA BOREHOLE LOCATIONS

84062

FIGURE 1

TASK NO.	852	WSRC DOCUMENTATION NO.	3840TM-5031-00
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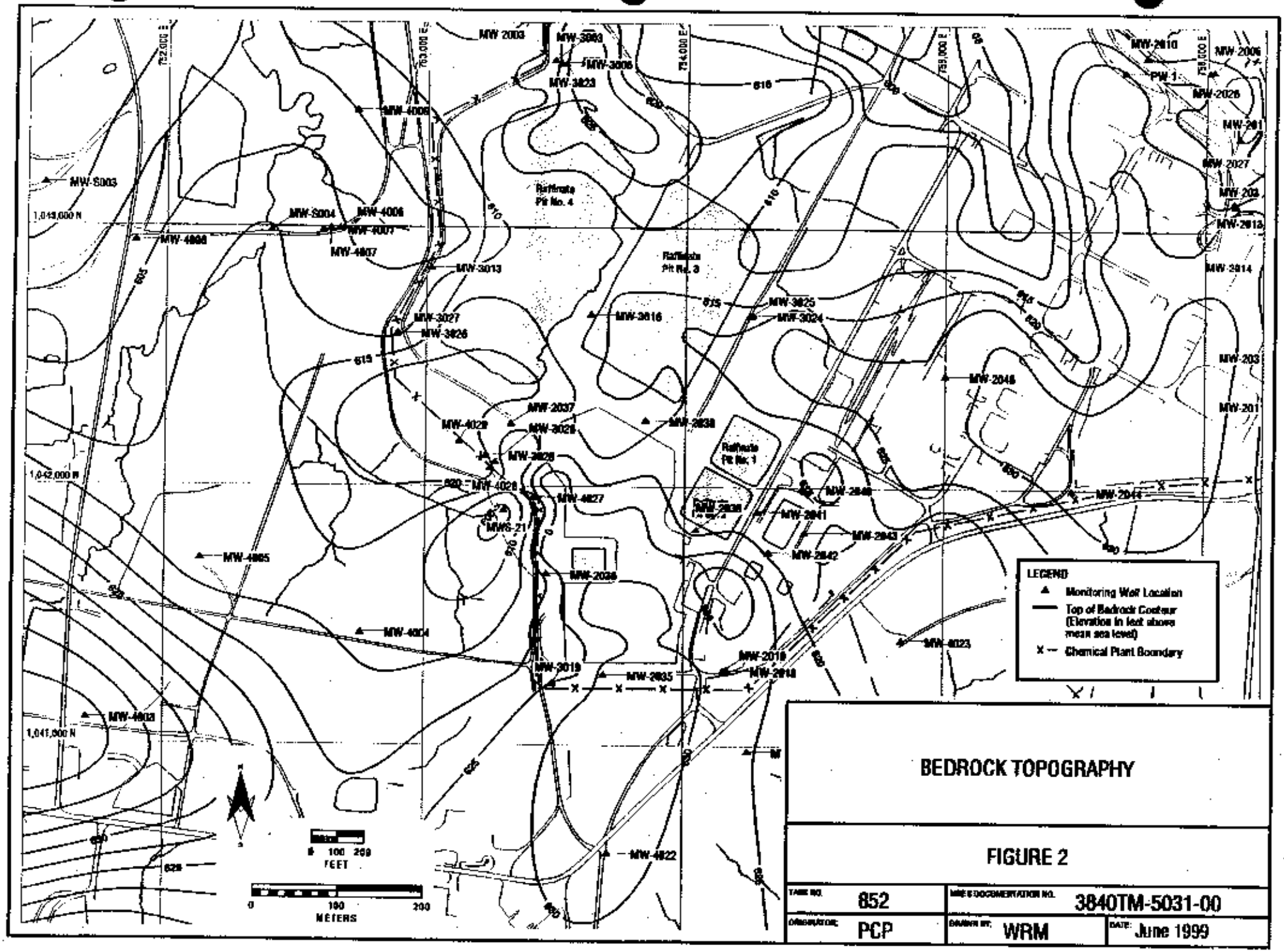
		DATE	June 1999



BEDROCK TOPOGRAPHY

FIGURE 2

TASK NO. 852		WRK'S DOCUMENT NO. 3840TM-5031-00	
ORIGINATOR: PCP	DRAWN BY: WRM		DATE: June 1999

R4069

ATTACHMENTS – BOREHOLE LOGS

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA-1-1

Project: TCE SOURCE INVESTIGATION	Location: NW CORNER OF TSA
Coordinates: 1042160.7 N 753592.6 E	Drilling Contractor: GEOTECHNOLOGY

Drill Make and Model:	Depth Top of Rock:	Depth Casing & Size:	Hole Size:
CME-55 ATV MOUNT	~49	NA	8.5"

Elevation:	Angle from Vert. and Bearing:	Depth Bottom of Hole:
666.56'	VERTICAL (0°)	49'

Water Level:	Fluid & Additives:	Date Start:	Date Finish:	Logger:
NA	NA	2/11/99	2/11/99	N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME-1	4/4	NA	CL	(0-2.5) Silty CLAY; mot rd brn & lt gry; high plas; little silt; some clay; tr vf qtz; feld sand; v stiff; tr. subang, fresh, ls gravel; damp; reworked; no odor; MnOx stain; FeOx nods; [Ferrel view Fill]
		4				OL	(2.5-5.0) Silty CLAY; blk; sl-med plas; little silt; some clay; tr. subang ls gravel road base; damp; organic odor; roots; reworked (compressed); firm [Remnant Topsoil (Fill?)]
1938	5	4	CME-2	5/5	NA	CL	(5-7.5) See 0-2.5' for description
		9				OL	(7.5-8.5) Silty CLAY; blk; sl-med plas; little silt; some clay; tr vf subang qtz sand; damp; organic odor; roots; native; not reworked; firm [Remnant Native Topsoil]
1950	10	9	CME-3	5/5	NA	ML	(8.5-10.5) Clayey Silt; rd brn; sl plas; little clay; mostly silt; tr vf sand; damp-dry; no odor; FeOx stain; loess?; firm [Roxana Silt]
		14				CH	(10.5-22) CLAY; mottled rd brn & lt gry; high plas; tr. silt; some clay; tr. vf subang qtz & feld sand; v stiff; damp; no odor, MnOx stain; FeOx nodules
	15	14	CME-4	5/5	NA		
		19					
1909	20	19	CME-5	5/5	NA		[Native Ferrel view]
		24				CL	See pg. 2 for description
	25	24 / 29	CME-6	5/5			[CLAY TILL]

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA-1-1

Project: TCE SOURCE INVESTIGATION
Location: NW CORNER OF TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	24–29	CME-6	5/5	NA	CL	(22-45) Silty CLAY; rd brn; med plas; some silt; some clay; little vf, qtz & feld, subang sand; tr. highly weathered granitic pebs; stiff; damp; no odor; MnOx stain
	30	29–34	CME-7	5/5	NA		
	35	34–39	CME-8	5/5	NA		
	40	39–44	CME-9	2/5	NO REC FROM 42-44'		[CLAY TILL]
	45	44–49	CME-10	5/5	NA	GC	(45-49) Clayey GRAVEL; white - lt gray chert & ls gravel (max size 3"); little v. plas fines; clay matrix = rd brn; v. dense; damp; p. sorted; subang - subround gravel appear mod weathered - 47-49 no gravel present, clay is v. high plas white - lt gray [Residuum]
	50						Boring terminated @ 49' bgs, due to auger; sampler refusal upon incompetent bed rock. Boring backfilled w/ bentonite slurry. Samples collected in 1-gal Zeplas @ 2.5' intervals as composites for PID headspace analysis.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, Task 15
Hole Number: TSA-1-2

Project: TCE Source Investigation
Location: NW CORNER OF TSA
Coordinates: 1042132.60 N 753543.84 E
Drilling Contractor: GEOTECHNOLOGY
Drill Make and Model: CME-55 ATV MOUNT
Depth Top of Rock: ~45'
Depth Casing & Size: NA
Hole Size: 8.5"
Elevation: 664.29
Angle from Vert. and Bearing: VERTICAL (0°)
Depth Bottom of Hole: 45'
Water Level: NA
Fluid & Additives: NA
Date Start: 2/11/99
Date Finish: 2/11/99
Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
	0	0–4	CME-1	4/4	NA	CL	(0-11) Silty CLAY; mottled rd brn & lt gry; high plas; little silt; some clay; tr vf-m gty sand; tr-little subang fresh gravel; damp; stiff-v. stiff; reworked; no odor; MnOx stain; FeOx nods; smear [Ferrel view Fill]
5	4	4–9	CME-2	5/5	NA		
10	9	9–14	CME-3	5/5	NA	CH	(11-20) CLAY; mottled rd brn & lt gray; high plas; tr silt; some clay; tr. vf subang gty sand; v stiff; damp; tr. granite pebs (weathered); no odor; MnOx stain; FeOx nods; decrease in FeOx w/ depth
15	14	14–19	CME-4	5/5	NA		-15-20', clay is predom. lt gry w/ tr. FeOx stain [NATIVE Ferrel view]
20	19	19–24	CME-5	5/5	NA	CL	(16-32) Silty CLAY; rd brn; med plas; some silt; some clay; little vf, gty subang sand; tr. high weathered granitic pebs; stiff; damp; no odor; aburdant MnOx stain [CLAY TILL]
25	24	24–29	CME-10	5/5	NA		

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA-1-2

Project: TCE Source Investigation
Location: NW CORNER OF TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	24–29	CME-6	5/5	NA		See pg 1 for description
1516	30	29–34	CME-7	5/5	NA	CL	
528	35	34–39	CME-8	5/5	NA		
550	40	39–44	CME-9	5/5	NA		[CLAY TILL]
						GC	(40-42.5) Clayey GRAVEL; lt gray gravel; yel brn matrix; some v. plas fines (clay; silt); little subang cherty sands; dense; damp-moist; p. sorted; p. bound; no odor [Basal Till?]
1608	45	44–45	SS-1	1/1	NA	GC	(42.5-45) Clayey GRAVEL; white - lt gray gravel, & rd matrix; little plas fines (clay); gravel is chert & mod weathered 1s up to 3" max; v. dense; damp; p. sorted; no odor [Residuum]
	50						Boring terminated @ 45' bgs due to sampler/auger refusal upon impenetrable Residuum. Boring backfilled w/ bentonite slurry upon completion. - Samples were collected in 1-gal Ziplocs @ 2.5' intervals as composites for PID headspace analysis

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-1-3

BOREHOLE LOG

Sampler - 3.0" I.D. CME continuous

Project: TCE at the Chem. Plant
Location: Inside TSA, NW, offset hole ~12'
Coordinates: 1041937.33N 753456.60E
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75, H.S. auger
Depth Top of Rock: 48.5
Depth Casing & Size: —
Hole Size: 4¼" / 8¼"
Elevation: 665.52'
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 48.5'
Water Level: —
Fluid & Additives: None
Date Start: 0820 2/11/99
Date Finish: 1020 2/11/99
Logger: A. Beafer

ELEVATION / DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0" ID)	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol)
	0	CME 1	5.0'			Lean clay (CL) - orange brown, with FeO nodules, moist, stiff, reworked Ferrelview clay.
5	5.0					at 1.5 - olive gray and brown, with some gravel. FILL
	5.0	CME 2	5.0'			Fill as above.
10	10.0					
	10.0	CME 3	5.0'			Lean clay (CL) mostly light brown with FeO nodules, moist, v. stiff - reworked Ferrelview - FILL
15	15.0					13' Lean clay (CL), mottled light brown and gray, abundant FeO nodules, moist - stiff. (Roxanna-like) Ferrelview
	15.0	CME 4	5.0'			17.0' Fat clay (CH) orange brown with light gray streaks (appear to follow paleo fractures), scattered FeO nodules, moist, V. stiff, slickensided, massive Ferrelview
20	20.0					Trace of sand 22.0'
	20.0	CME 5	5.0'			Fat clay (CH) ~ 20% sand, ~ 5% fine gravel, mottled yellow brown, with light gray and black (MnO). Moist, V. Stiff. CLAY TILL
25	25.0					

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-1-3

Project: ICE at the Chem. Plant
Location: inside TSA, NW

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
							Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
0825	30	25.0–30.0	CME 6	5.0'	6		Fat clay (CH) ~20% sand, trace of fine gravel, minor FeO nodules, predominantly yellow brown with streaks of light gray and black, both appear to follow fractures, damp to moist, V. stiff. CLAY TILL
	35	30.0–35.0	CME 7	5.0'			✓ as above, scattered gravel ~5% fine to up to 1", light gray does follow fractures (mostly healed), black also follows fractures (open) but also as nodules at 33–35' - yellow brown only
0940	40	35.0–40.0	CME 8	5.0'			CH as above, gravel pockets of chert up to 2", Clean fine sand lense at 37.5' (3") light gray and black coating fractures. ~40'
	45	40.0–45.0	CME 9	40'			Lean Clay, silty, light gray with orange brown FeO blebs., blocky texture, moist, stiff CLAY TILL 44'
		45.0–48.5	CME 10	3½'			Clayey gravel, (GC), angular chert with plastic clay matrix, orange brown moist, dense, at 47': 3" seam of high plastic clay Residuum
1010	50		SPT	=	25/2"		T.D. 48.5' 1020, on Limestone. 2/11/99 Hole backfilled with Grout Well bentonite slurry

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-1-4

BOREHOLE LOG

3.0" I.D. CME continuous Sampler

Project: TCE at the Chem Plant
Location: Inside TSA, NW
Coordinates: 104207.235N 75361.8.52E
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. Auger
Depth Top of Rock: 45.5'
Depth Casing & Size: —
Hole Size: 4¼" / 8¼"
Elevation: 663.90
Angle from Vert. and Bearing: vertical
Depth Bottom of Hole: 45.5
Water Level: —
Fluid & Additives: none
Date Start: 1535 2/10/99
Date Finish: 1645 2/10/99
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME 1	5.0'			Lean clay, brown or dark brown, abundant FeO nodules, moist, stiff. Reworked Ferrelview Clay
	5	5.0					5-6', old topsoil FILL 6.0'
		5.0	CME 2	5.0'			Lean Silty Clay (CL) mottled orange brown and dark gray, abundant FeO nodules moist, stiff. Ferrelview Clay at 8', mostly light brown. (Roxanna silt)
	10	10.0					11'
		10.0	CME 3	5.0'			Fat clay (CH) mostly orange brn, moist light gray, some FeO nodules, massive highly plastic, moist stiff, slickensided. at 13', mostly light gray.
	15	15.0					
		15.0	CME 4	5.0'			CH as above 18.5'
	20	20.0					
		20.0	CME 5	5.0'			Fat clay, (CH), ~10% sand, some fine gravel, mottled yellow-orange brown, light gray with black streaks (MnO), moist, v stiff, CLAY TILL at 21', ~20% sand, 10% fine grvl, orange brown to brown with light gray, MnO nodules and streaks, larger gravel at 24', CLAY TILL
	25	25.0					

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

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Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-1-4

Project: T&E at Hunchem Plant
Location: Inside TSA, NW

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		25.0	CME 6	5.0'			fat clay (CH) yellow brown, ~20% sand, ~10% gravel, streaks of MnO, Moist, V. Stiff. CLAY TILL
	30	30.0					at 29', increase in gravel
		30.0	CME 7	5.0'			As above, light gray and black tend to fedoux fractures; damp -
	35	35.0					
		35.0	CME 8	5.0'			as above to 36.5. at 36.5 - 37.5, heavy gravel zone - 37.5 - 39.0', light brown, very silty clay -
	40	40.0					40'
		40.0	CME 9	4.0'			Clayey Gravel, (GC) angular Chert, red-dish brown to brown high plastic clay matrix, Moist, dense. Residuum
	45	45.0					
							T.D. 45.5', probably bed-rock, 1645 2/10/99. Hole backfilled with Grout Well bentonite slurry.

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, Task 15
Hole Number: TSA-1-S

Project: TCE SOURCE INVESTIGATION
Location: NW CORNER OF TSA (OUTSIDE FENCE)
Coordinates: 1042019.31N 753455.53E
Drilling Contractor: GEOTECHNOLOGY
Drill Make and Model: CME-55 ATV-MOUNT
Depth Top of Rock: ~33'
Depth Casing & Size: NA
Hole Size: 8.5"
Elevation: 659.02
Angle from Vert. and Bearing: VERTICAL (0°)
Depth Bottom of Hole: 33'
Water Level: NA
Fluid & Additives: NA
Date Start: 2/19/99
Date Finish: 2/19/99
Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
	0	0					(0-8) Silty CLAY; mottled rd brn & lt gray; high plas; little silt; some clay; tr vf-m gty sand; tr-little subang fresh gravel; damp; stiff-v stiff; (reworked); no odor; MnOx stain; FeOx nods (smeared) [FERRELVIEW FILL]
		35	CME-1	35/35	NA	FILL (CL)	
	5	5.5	CME-2	5/5	NA		
		8.5				OL	(8-8.5) Silty CLAY; blk; sl-med plas; little silt; some clay; damp; firm; org odor; tr sand; roots [Cement Topsoil]
	10	8.5	CME-3	5/5	NA	CH	(8.5-16) CLAY; mottled rd brn & lt gray; high plas; tr silt; mostly clay; tr vf-med gty sand; tr granitic (v. weathered) peb; v stiff; damp; slickensided; no odor; MnOx stain; abundant FeOx nods [Ferrelview]
		13.5					
	15	13.5	CME-4	5/5	NA		
		18.5					
	20	18.5	CME-5	5/5	NA	CL	(16-29) Silty CLAY; rd brn; med plas; some silt; some clay; little vf gty; subang sand; tr-high weathered granitic peb; abundant MnOx stain; no odor; v stiff - > peb content w/ depth [CLAY FILL]
		23.5					
	25	28.5	CME-5	5/5	NA		
		28.5					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, Task 15
Hole Number: T8A-1-5

Project: TCE SOURCE INVESTIGATION
Location: NW CORNER OF T8A (OUTSIDE FENCE)

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	23.5 – 28.5	CME-6	5/5	NA	CL	(See pg. 1 for description) [CLAY TILL]
	30	28.5 – 33	CME-7	4.5/4.5	NA	GC	(29-33) Clayey GRAVEL; white & lt. gry subround gravel; red clay matrix; little v plas fines; v. dense; gravel is chert & is up to 3" max; damp; p. sorted; gravel mod weathered; no odor [Residuum]
	35						Boring terminated @ 33' bgs due to auger/sampler refusal upon impenetrable Residuum
							Boring backfilled w/ bentonite slurry upon completion
	40						Samples collected in 1 gal Ziplocs @ 2.5' intervals as composites for PID headspace analysis.
	45						
	50						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-4761, Task 15
Hole Number: TSA-1-6

Project: TCE SOURCE INVESTIGATION			Location: NW CORNER OF TSA	
Coordinates: 1042043.73 N 753553.03E			Drilling Contractor: GEOTECHNOLOGY	
Drill Make and Model: CME-55 ATV MOUNT	Depth Top of Rock: NA	Depth Casing & Size: NA	Hole Size: 8.5"	
Elevation: 662.51	Angle from Vert. and Bearing: VERTICAL (0°)	Depth Bottom of Hole: 38' bgs		
Water Level: NA	Fluid & Additives: NA	Date Start: 2/10/99	Date Finish: 2/10/99	Logger: N.BOSS

ELEVATION / DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
0	0–3	CME-1	3/3	NA	CL	(0-6.5) Silty CLAY; mottled rd brn & lt gry; high plas; little silt; some clay; tr. vf-m gry sand; tr-little subang frags to gravel; damp; reworked; compressed; no odor; Mn Ox stain; Fe Ox nodules [Ferncliff Fill]
5	3–8	CME-2	5/5		OL	(5-6.5) Silty CLAY; blk; sl-med plas; little silt; some clay; tr. subang to gravel road base; damp; organic odor; roots [Remnant Topsoil]
10	8–13	CME-3	5/5		CH	(6.5-16) CLAY; mottled rd brn & lt gry; high plas; trace silt; some clay; tr. vf subang gry sand; v. stiff; damp-dry; no odor; Mn Ox stain; Fe Ox nodules; [Native Ferncliff]
15	13–18	CME-4	5/5			-> sdl to 25% from 8-11' bgs
20	18–23	CME-5	5/5		CL	(16-32) Silty CLAY; rd brn; med plas; some silt; some clay; little vf, gry, subang sand; tr. high weathering granite pebs; stiff; damp; no odor; Mn Ox stain [CLAY TILL]
25	23–28	CME-6	5/5			-> sand & silt units - from 20-22 (Sandy Silt)

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, Task 15
Hole Number: TSA-1-6

Project: TCE SOURCE INVESTIGATION
Location: NW Corner of TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	23 – 28	CME-6	5/5	NA		See pg 1 for description
	30	28 – 33	CME-7	5/5	NA		
	35	33 – 38	CME-8	5/5	NA	CL	(32.5-36) Silty CLAY; lt. gry; med-high plas; some silt; some clay; stiff; laminated; dry; no odor; FeOx stain tr. granitic pebs [Basal Till]
						GC	(36-38) Clayey GRAVEL; white chert & ls gravel (up to 3"); little plas fines; clay matrix is rd brn; v. dense; damp; p sorted; gravel = weathered [Residuum]
	40						Boring terminated @ 38' bgs due to sampler/auger refusal upon impenetrable Residuum. Boring back-filled w/ bentonite slurry.
	45						- Samples collected in 1 gal Ziploc @ 2.5' intervals as composite for onsite PID head space screening

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-1-7

Project: TCE at the Chem. Plant
Location: Inside TSA - NW
Coordinates: 104197.78N 75356.11E
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75, U.S. auger
Depth Top of Rock: 30'
Depth Casing & Size:
Hole Size: 4¼" / 8¼"
Elevation: 661.84
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 39.5'
Water Level:
Fluid & Additives:
Date Start: 1015 2/10/99
Date Finish: 1420 2/10/99
Logger: A. Bonfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0")	RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME 1	5.0			Reworked Ferrelview Clay - Fill trace gravel.
	5	5.0					
1025		5.0	CME 2	5.0'			Fat clay (CH), dark gray, moist, stiff 5-7.5' limestone gravel with clay matrix, probable old road. 7.5-10.0 - lean clay (CL), olive gray, moist, stiff- fill
	10	10.0					
		10.0	CME 3	5.0'			CL 10.5' Lean clay, silty, orange brown and light gray with abundant black MnO and abundant FeO nodules, moist, V. stiff Ferrelview 13.0'
							CH Fat clay, mottled orange brown with some light gray, ¼" FeO nodules, moist, very stiff, massive. Ferrelview 15.0'
	15	15.0					
			CME 4	5.0'			Fat clay (CH) ~20% sand, some fine to coarse gravel, mottled orange brown light gray, FeO nodules, MnO streaks, moist V. stiff CLAY TILL 17.5'
	20	20.0					Fat clay, (CH) trace sand, mottled orange/brown light gray, black, massive, moist very stiff, slickensided. 20'
		20.0	CME 5	5.0			Fat clay (CH) ~10% fine to coarse sand ~5% fine gravel, mostly yellow brown with some light gray, considerable black MnO. Moist, V. stiff. CLAY TILL
	25	25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-1-7

Project: TCE at the Chem Plant
Location: inside TSA, NW

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		25.0	CME 6	5.0'			Fat Clay (CH) ~15% sand & ~10% fine gravel, mottled yellow brown, orange brown, light gray & black, some FeO nodules, MnO streaks, moist very stiff, highly plastic CLAY TILL
1330							
	30	30.0					
		30.0	CME 7				
345							32.5' Fat Clay (CH) mottled reddish brown, orange brown, some light gray and black FeO nodules, moist, v. stiff - Highly plastic CLAY TILL
						34.5	
	35	35.0					Clayey gravel, red high plastic clay matrix (GC) Residuum
		35.0	CME 8				As above, red, orange brown, light brown black, zones of less gravel 38'
		38.0	SPT		28 28 30		Chert and weathered limestone.
		37.5					
	40						T.D. 39.5' 1420 2/10/99 hole backfilled with Grout Well bentonite slurry
	45						

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA1-8

Project: TCE SOURCE INVESTIGATION	Location: NW CORNER OF TSA (OUTSIDE FENCE)
Coordinates:	Drilling Contractor: GEOTECHNOLOGY
Drill Make and Model: CME-55 ATV MOUNT	Depth Top of Rock: 32 / Depth Casing & Size: NA / Hole Size: 8.5"
Elevation:	Angle from Vert. and Bearing: VERTICAL (0°) / Depth Bottom of Hole: 32.5'
Water Level: NA	Fluid & Additives: NA / Date Start: 2/19/99 / Date Finish: 2/19/99 / Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0–3	CME-1	3/3	NA	FILL	LS. gravel road base (0-1')
						OL	(1-5) Silty CLAY; o/k; sl-med plas; little silt; some clay; damp; firm; org odor; tr. qtz sand; roots appears reworked/compressed (Fill?) [Topsoil]
5	3–8	3–8	CME-2	5/5	NA	ML	(5-8.5') Clayey SILT; rd brn; sl plas; little clay; mostly silt; tr. vf sand; damp-dry; no odor; FeOx stain; firm; locas?; fissile - solvent odor from 6-8' [Loxam Silt]
10	8–13	8–13	CME-3	5/5	NA	CH	(8.5-14) CLAY; mottled rd brn; lt gray; high plas; tr. silt; some clay; tr. vf subang qtz; feld sand; occ v. weathered granitic pebs; v. stiff; damp; no odor; MnOx stain; FeOx nods; slickensided [Native Fernelview]
15	13–18	13–18	CME-4	5/5	NA	CL	(14-20) Silty CLAY; rd brn; med plas; some silt; some clay; little vf qtz, subang sand; abundant MnOx stain; tr. rounded granitic pebs; firm
20	18–23	18–23	CME-5	5/5	NA		-> fine-med qtz sand content from 18-22 (up to 20%)
25	23–28	23–28	CME-6	5/5	NA		[CLAY TILL]

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project number: WP-476, TASK 15
Hole Number: TSA1-8

Project: TCE SOURCE INVESTIGATION
Location: NW CORNER OF TSA (OUTSIDE FENCE)

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol)
	25	23				CL	See pg. 1 for description [CLAY FILL]
		28	ONE-6	5/5	NA	GC	(26-32') Clayey GRAVEL; white; lt.gry subrounded-subang; gravel; red-brn clay matrix; little v. plas fines; vdense; gravel is chert; to up to 3" max; deep; p sorted; gravel is mod weathered
	30	28	ONE-7	4.5/4.5	NA		-matrix changes to lt gry in color [Residuum]
		32.5				LS	(32-32.5') Weathered Limestone; lt.gry (N6) ss/l. fossiliferous; mod weathered; fine-grained; high porosity; high perm to HCL; mod hard [Burlington-Keokuk]
	35						Boring terminated @ 32.5' bgs due to refusal upon confirmed bedrock. Boring backfilled w/ bentonite slurry.
	40						- Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for onsite PID headspace screening.
	45						
	50						
	55						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA 2-1

Project: TCE SOURCE INVESTIGATION	Location: West side of TSA (Outside fence)
Coordinates: 1041778.19N 753479.33E	Drilling Contractor: GEOTECHNOLOGY

Drill Make and Model:	Depth Top of Rock:	Depth Casing & Size:	Hole Size:
CME-55 ATV MOUNT	~26.5'	NA	8.5"

Elevation:	Angle from Vert. and Bearing:	Depth Bottom of Hole:
654.15	VERTICAL (0°)	26.5'

Water Level:	Fluid & Additives:	Date Start:	Date Finish:	Logger:
NA	NA	2/18/99	2/18/99	N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0–3	CME-1	3/3	NA	CL	(0-4) Silty CLAY; mottled rd brn & lt. gry; high plas; little silt; some clay; tr. vf-m qtz sand; tr-little roots; damp; stiff-v. stiff; reworked; no odor; MnOx & FeOx stain; 0-1.5' is highly organic [Ferrelview Fill]
	5	3–8	CME-2	5/5	NA	ML	(4-7) Clayey SILT; rd brn; sl. plas; little clay; mostly silt; tr. vf sand; damp-dry; no odor; FeOx stain; loess?; firm [Roxana Silt]
	10	8–13	CME-3	5/5	NA	CH	(7-14) CLAY; mottled rd brn & lt. gray; high plas; tr. silt; some clay; tr vf subang qtz & feld sand; v. stiff; damp; no odor; MnOx stain; FeOx nodules [Ferrelview Native]
	15	13–18	CME-4	5/5	NA	CL	(14-23.5) Silty CLAY; rd brn; med plas; some silt; some clay; little vf qtz & feld sand; tr high weather granitic pebs; v. stiff; damp; no odor; abundant MnOx stain
	20	18–23	CME-5	5/5	NA	CL	- < stiffness & fissile [CLAY TILL]
	25	23–26.5	CME-6	35/35	NA	GC	(23.5-26.5) Clayey GRAVEL; lt. gry gravel; rd brn matrix; little plas fines; v dense; gravel is subang. chert & ls; damp; p sorted; weathered; no odor [Residuum]

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA 2-1

Project: TCE SOURCE INVESTIGATION
Location: West side of TSA (outside fence)

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	23 26.5	CME-6	35/35	NA	GC	See pg 1 for description [Residuum]
							Boring terminated @ 26.5' bgs due to auger / sampler refusal upon impenetrable Residuum.
	30						Boring backfilled w/ bentonite slurry upon completion.
	35						Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for PID headspace analysis.
	40						
	45						
	50						
	55						

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA-2-2

Project: TCE SOURCE INVESTIGATION			Location: West side of TSA (outside fence)	
Coordinates: 104732.92N 753486.52			Drilling Contractor: GEOTECHNOLOGY	
Drill Make and Model: CME-55 ATV MOUNT	Depth Top of Rock: NA	Depth Casing & Size: NA	Hole Size: 8.5"	
Elevation: 652.06	Angle from Vert. and Bearing: VERTICAL (0°)	Depth Bottom of Hole: 27.5'		
Water Level: NA	Fluid & Additives: NA	Date Start: 2/18/99	Date Finish: 2/18/99	Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0				FILL	(0-3) Silty CLAY; mottled rd brn & lt gry; high plas; little silt; some clay; tr. vf-med gty sand; damp; stiff-v stiff; reworked; no odor; 0-1.5' = highly organic [Fenceline fill]
	4	4	CME-1	4/4	NA	CL/OL	
5	9	4	CME-2	5/5	NA	ML	(3-6.5) Clayey SILT; rd brn; sl. plas; little clay; mostly silt; damp-dry; tr. vf-sand; no odor; abundant MnOx stain; firm; loess? [Roxana Silt]
10	14	9	CME-3	5/5	NA	CH	(6.5-14.5) CLAY; mottled rd brn & lt gry; high plas; tr. silt; mostly clay; tr vf subang-subround gty; feld sand; v. stiff; damp; no odor; MnOx stain; FeOx nods [Native Fenceline]
15	19	14	CME-4	5/5	NA	CL	(14.5-24.5) Silty CLAY; rd brn; med plas; some silt; some clay; little gty; feld sand; tr. granitic pebs; v. stiff; damp; no odor; abundant MnOx stain
20	24	19	CME-5	5/5	NA		-> silt w/ depth, fissile
25	27.5	24	CME-6	3.5/3.5	NA	GIC	See Pg 2 for description [Residuum]

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA-2-2

Project: TCE SOURCE INVESTIGATION
Location: West side of TSA (outside fence)

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	24					(24-27.5) Clayey GRAVEL; lt gray-white gravel; rd brn clay matrix; little plas fines; v dense; gravel is sub-ang chert; lo; damp; P sorted; weathered; no odor
		27.5	Cuttings	3.5/3.5	NA	GC	[Residuum]
	30						Boring terminated @ 27.5' bgs due sampler / auger refusal upon impenetrable Residuum.
	35						Boring backfilled w/ bentonite slurry upon completion.
	40						Samples collected in 1 gal Ziplocs @ 2.5' intervals as composites for PID headspace analysis.
	45						
	50						
	55						

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 82
Hole Number: TSA-2-3

Project: TCE at the Chem Plant
Location: W. side TSA, outside fence - offset hole ~25' W.
Coordinates: 104167.71N 753480.84E
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. auger
Depth Top of Rock: Possibly 34'
Depth Casing & Size: —
Hole Size: 4¼" / 8¼"
Elevation: 656.27'
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 34'
Water Level: —
Fluid & Additives: —
Date Start: 2/4/99 1445
Date Finish: 2/4/99 1445
Logged: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME 1 (3.0")	5.0			Lean Clay (CL) dark brown, some organics Moist FILL
	5	5.0	CME 2	5.0			2.5' Fat Clay (CH) mottled orange brown and black, V. stiff, some FeO Nodules FERREL VIEW CLAY
	10	10.0	CME 3	5.0			As above, Massive, some FeO & MnO nodules, V. stiff (3.0).
	15	15.0	CME 4	5.0			Mostly light gray, Slickensided
	20	20.0	CME 5	5.0			17.0 Fat Clay (CH) with ~ 15% sand and fine gravel, Mottled orange brown and light gray - some MnO streaks V. stiff CLAY TILL
	25	25.0					at 23.5' abundant fine gravel angular limestone

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Test 852
Hole Number: TSA-2-3

Project: TCE at the Chem. Plant
Location: W. Side TSA, outside fence - offset hole ~25' to west

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		25.0	CME 6	4.0'			Gravel with fat clay, gravel weathered and soft clay orange brown, gravel light gray. CLAYTILL
	30	30.0			LOSS		
			CME 7	2.0			As above -
		34.0			LOSS		
	35						T.D. 34', auger refusal. 1445 2/24/99. Hole backfilled with Cement weel bentonite.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task B52
Hole Number: TSA-2-4

Project: TCE at the Chem. Plant
Location: W. of TSA, outside fence, offset hole ~4'
Coordinates: 1041619.59 N 753483.70 E
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. augers
Depth Top of Rock: probable 37.5
Depth Casing & Size: —
Hole Size: 4 1/4" / 8 1/4"
Elevation: 658.12
Angle from Vert. and Bearing: vertical
Depth Bottom of Hole: 37.5'
Water Level: —
Fluid & Additives: —
Date Start: 10 25 2/4/99
Date Finish: 1410 2/4/99
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE: INTERVAL	SAMPLE: TYPE & NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME 1	5.0'			Lean Clay (CL), brown, some roots, moist, Minor gravel - FILL Increase Gravel at 3', dark brown,
	5	5.0	CME 2	5.0'			3.5' Lean Clay (CL), Mottled brown and light brown, dark brown, some FeO nodules - FERRELVIEW CLAY. as above (Roxanna-like)
	10	10.0	CME 3	5.0			8' Fat Clay (CH) mottled, orange brown and light gray, moist, stiff to very stiff (2.0) Ferrelview CH as above - massive. Some slickensides and FeO nodules
	15	15.0	CME 4	5.0'			Predominantly light gray at 17.5' becoming sandy. at 19.5' - 1" sand lense.
	20	20.0	CME 5	5.0			22.5' Fat Clay with Sand (CH), ~ 15% - minor fine gravel, Mottled yellow brown to orange brown, light brown, some MnO, CLAY TILL
	25	25.0					

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-2-4

Project: TCE at the Chem. Plant
Location: W. side TSA - outside fence

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		25.0	CME 6	2½	TSA-2-4 25.0-27.5		increase in gravel.
					Loss		
	30	30.0	CME 7	2½'	TSA-2-4 30.0-32.5		Fat clay with angular limestone gravel up to 2"; some chert. Clay orange brown. CLAY TILL; possibly Residuum.
					No SS		
	35	35.0					35
			CME 8	2½'			As above, predominantly yellow brown. Probable residuum
		37.5					T.D. 37.5' auger refusal 1410 2/4/99. Probable bedrock. Hole backfilled with Grout Well bentonite

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-3-1

Project: TCE at the Chem. Plant
Location: Outside Fence, W. side TSA - offset hole ~15' west
Coordinates: 1041461.85N 753480.41
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. auger
Depth Top of Rock: ~30
Depth Casing & Size: —
Hole Size: 4 1/4" / 8 1/4"
Elevation: 656.11
Angle from Vert. and Bearing: vertical
Depth Bottom of Hole: 30'
Water Level: —
Fluid & Additives: —
Date Start: 0815 2/4/99
Date Finish: 0915 2/4/99
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		0	CME 1	5.0'			Lean Clay, dark brown, some organics, moist - Fill CL
	5	5.0 / 5.0	CME 2	5.0'			6.0' 6-7', Lean clay, dark gray, abundant FeO & MnO nodules. Ferrelview CL 7'- Fat Clay (CH), mottled orange brown, light gray, minor FeO nodules very stiff (3.0) Ferrelview
	10	10.0 / 10.0	CME 3	5.0'			minor gravel at 14' ~15% sand at 15'
	15	15.0 / 15.0	CME 4	5.0'			at 19' - gravelly
	20	20.0 / 20.0	CME 5				20' Fat Clay (CH) ~15% sand & fine gravel, yellow brown, black, moist very stiff - CLAY TILL at 23' mostly gray & black
	25	25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 2 of 2
Project Number:
Hole Number TSA-3-1

Project: TCE at the Chem Plant
Location: W. side TSA · Outside Fence

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOL & LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		25.0	CME				~~Fat Clay~~ gravelly Fat Clay with sand - yellow brown, black, light
			6	40'			Clay (gravel). Gravel is angular limestone, ~~some chert~~.
							CLAYTILL
		30.0					
							T.D. 30.0' auger Refusal
							0915

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: task 852
Hole Number: TSA-3-2

Project: TCE at the Chem Plant
Location: inside TSA
Coordinates: 104148.03N 75362.27E
Drilling Contractor: Geotech no 094
Drill Make and Model: CME-75 H.S. auger
Depth Top of Rock: Possibly 32'
Depth Casing & Size: —
Hole Size: 4¼" / 8¼"
Elevation: 662.39
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 32'
Water Level: —
Fluid & Additives: —
Date Start: 1635 2/6/99
Date Finish: 1615 2/6/99
Logger: Hobaugh

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol)
	0	0	CME 1	5.0			Lean Clay, some gravel, mostly olive gray, moist stiff FILL
5		5.0					6.0
		5.0	CME 2	5.0'			Fat clay (CH) - mottled orange brown light, Fe2 nodules, moist, V. stiff. FERRELVIEW CLAY at 8.0' - massive, highly plastic
10		10.0					as above, slickensided
		10.0	CME 3	5.0			
15		15.					
		15.0	CME 4	5.0			16.0 Fat CLAY, trace sand & fine gravel, mottled yellow brown & light gray, some black (MnO), moist V. stiff CLAY TILL
20		20.0					at 22.5' - increase in gravel and MnO.
		20.0	CME 5	5.0'			
25		25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: TANK 852
Hole Number: TSA-3-2

Project: TCE at the Chem. Plant
Location: Inside TSA.

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		25.0	CME				at 30.' 4" Clayey fine sand loose v. moist
			6	5.0'			28.5'
		30.0					Clayey gravel - up to 1½" black with white, highly plastic clay, abundant MnO, moist, dense Probable Residuum
30		30.0	CME				
		32.0	7	2.0'			
							T.D. 32.' refusal 1615 2/4/99 hole grouted with Guard Well Bentonite.

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

Sheet 1 of 2

Project Number: Task 852

Hole Number: TSA-3-3

BOREHOLE LOG

Project: TCE at the Chem. Plant	Location: Inside TSA (2nd hole, Moved ~3')		
Coordinates: 104 1405.31 N 753555.52E	Drilling Contractor: Geotechnology		
Drill Make and Model: CME-75	Depth Top of Rock: 42.5'	Depth Casing & Size:	Hole Size: 4¼"/8¼"
Elevation: 665.0'	Angle from Vert. and Bearing: Vertical	Depth Bottom of Hole: 42.5'	
Water Level: —	Fluid & Additives: —	Date Start: 0950 2/8/99	Date Finish: 1400 2/8/99
Logger: A. Benfer			

ELEVATION / DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution; Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
0	0	CME 1	3½'			Lean clay (CL) mottled orange brown and light brown, moist, V. stiff, trace gravel. Reworked Fortelview FILL
5	5.0					
	5.0	CME 2	5.0'			- mostly olive gray, trace gravel FILL
10	10.0					
	10.0	CME 3	5.0			FILL 12.0'
15	15.0					Lean Clay (CL), silty, mottled orange brn and gray, abundant FeO nodules, moist stiff Fortelview
	15.0	CME 4	5.0'			CL - with light gray, FeO, MnO nodules, V. stiff (3.0)
20	20.0					20'
	20.0	CME 5	5.0'			Fat Clay, ~10% sand and fine gravel, mottled orange brown, gray, moist, V. stiff at 23' - mostly light gray. CLAY TILL
25	25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-3-3

Project: TCE at the Chem. Plant.
Location: Inside TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		25.0	CME 6	5.0'			Increase in gravel content at 29': heavy gravel
30	30.0	30.0	CME 7	5.0			Fat Clay (CH) occasional gravel, orange brown and black, moist, stiff. at 33.5' - CH, light gray with indurated clay fragments (unusual), damp at 35': heavy gravel.
		35.0	CME 8	3.5'			Clay with gravel, light gray and orange brown probably CLAY TILL ~40'
		40.0	CME 9				Fat Clay (CH) with chert gravel, reddish brown possibly Residuum
		42.9					T.D. 42.5' Refusal on bedrock 1335 2/8/89 Hole backfilled with bentonite

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-3-4

Project: TCE at the Chem. Plant
Location: SW Corner TSA outside fence, offset ~8'
Coordinates: 104328.06N 753483.40
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. Auger
Depth Top of Rock: probable 37'
Depth Casing & Size: —
Hole Size: 4¼"/8¼"
Elevation: ~657.06'
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 37
Water Level: —
Fluid & Additives: —
Date Start: 1400 2/3/99
Date Finish: 1530 2/3/99
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0						
		0	CME 1	5.0'	TSA A-4 0-2.5		Lean Clay with occasional limestone gravel (CL), roots to ~1.0', dark brown, moist, very stiff (2.5). Fill
					TSA-A4 2.5-5.0'		3.0'
	5	5.0					Lean clay (CL), mottled light brown, gray orange/brown, FeO, MnO, moist, very stiff (2.5). Ferrel view. (Roxanna-like)
		5.0	CME 2	5.0	TSA-A-4 5.0-7.5'		mostly light gray
					TSA-A-4 7.5-10.0		mostly orange brown.
	10	10.0					10.0'
		10.0	CME 3	5.0	TSA-A-4 10.0-12.5		Fat Clay, Mottled orange brown and light gray, moist, very stiff (3.0). some slickensides Abundant FeO nodules 12-14'.
					TSA-A-4 12.5-15.0		
	15	15.0					CH. mottled reddish brown, light gray + black (MnO). at 17', some fine limestone gravel and angular limestone sand, white. lower Ferrel view.
		15.0	CME 4	5.0	TSA-A-4 15.0-17.5		
					TSA-A-4 17.5-20.0'		
	20	20.0					21.0'
			CME 5	5.0	TSA A-4 20.0-22.5		Fat Clay with gravel, up to 2" (CH) yellow brown + black (MnO), minor light gray. some sand. Clay Till
					TSA-A-4 22.5-25.0		
	25	25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-3-4

Project: TSA at Chem Plant
Location: SW corner TSA outside Fence

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25.0		CME 6	5.0'	TSA-A-4 25.0'-27.5'		Lean Clay (CL) minor limestone gravel, buff, damp, very stiff (PP = 2.5)
					TSA-A-4 27.5'-30.0'		27.5
30	30.0						
	30.0		CME 7	5.0'			Mostly yellow brown, moist, with angular limestone and chert gravel. Possibly Residuum saturated ~33'-34',
35	35.0						sample refusal
			Auger only				auger refusal 37', probable bedrock 1530 2/3/99 grouted hole with grout - Well

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 1 of 2
Project Number: Task 852
Hole Number: TIA-IS-3-5

Project: TCE at the Chem Plant
Location: inside TSA, south end
Coordinates: 1041353.87N 753646.26E
Drilling Contractor: Keeotech/a1094
Drill Make and Model: CME-75 H.S. auger
Depth Top of Rock: probably 31.5'
Depth Casing & Size: —
Hole Size: 4¼" / 8¼"
Elevation: 665.63
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 31.5'
Water Level: —
Fluid & Additives: —
Date Start: 1415 2/6/99
Date Finish: 1500 2/6/99
Logger: A. Beaufer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0" ϕ)	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
	0	0	CME 1	5.0'			Lean Clay (CL) mostly dark gray with some gravel, moist stiff - at 2.5' - mostly orange brown and gray. Reworked Ferrelview FILL
	5	5.0	CME 2	5.0'			some olive gray
		10.0					8.0' Fat Clay (CH) mottled orange brown & gray, moist, v. stiff, abundant FeO nodules - Ferrelview.
	10	10.0	CME 3	4.0'			massive, very plastic, less FeO,
	15	15.0	CME 4	5.0'			slickensided, MnO
	20	20.0	CME 5	5.0'			as above - ~10% sand, Trace fine gravel -
	25						23.5' Fat Clay (CH) mottled yellow brn & gray, ~10% sand, trace f. gvl. moist stiff CLAY TILL

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-IS-3-5

Project: TCE at the Chem Plant
Location: inside TSA - south end

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		25.0	CME 6	5.0'			Fat Clay (CH), ~15% sand, 10% fine gravel, mottled yel. brn, light gray, some black (MnO), moist v. stiff. CLAY TILL
	30	30.0					Increase in gravel, up to 2", at 29.5 - abundant MnO - black
		30.0	CME 7	1.5			abundant gravel, light brown to white. Maybe Residuum.
		31.5					T.D. 31.5' 1500 2/6/99 Refusal
	35	3					Hole grouted with Grout Well bentonite.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Kevin Bessler driller

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-3-6

Project: TCE at the Chem Plant	Location: SW corner TSA outside Fence
Coordinates: 1041262.41N 753537.09E	Drilling Contractor: Geotechnology
Drill Make and Model: CME - 75 H.S. Auger	Depth Top of Rock: — ? / Depth Casing & Size: — / Hole Size: 4 1/4 / 8 1/4"
Elevation: 660.85'	Angle from Vert. and Bearing: Vertical / Depth Bottom of Hole: 28'
Water Level: —	Fluid & Additives: — / Date Start: 0955 2/3/99 / Date Finish: 1300 2/3/99 / Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N) Samples	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	1, 2, 3, 4	0 – 4.5	CME 1	3.5'	TSA-3-1 / TSA-3-1		0-1.0 - Lean Clay with limestone gravel, dark brown, wet, topsoil CL. Lean Clay (CL), mottled orange brown and light brown with dark gray, minor FeO & MnO, moist, v. stiff (2.5) Ferrelview Clay (Roxanna-like)
		4.5 – 9.5	CME 2	5.0	TSA-3-2 / TSA-3-2		8.5'
	10	9.5 – 14.5	CME 3	5.0'	TSA-3-3 / TSA-3-3		Fat Clay, (CH), mottled orange brown & light gray, minor MnO, v. stiff (2.5) Ferrelview. at 12.' mostly light gray
	15	14.5 – 19.5	CME 4	5.0'	TSA-3-4 / TSA-3-4		As above
	20	19.5 – 24.5	CME 5	5.0'	TSA-3-5 / TSA-3-5		at 20', with fine limestone gravel and angular sand, white, ~15% Lower Ferrelview
	25	24.5					24.5'

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 952
Hole Number: TSA-3-6

Project: TCE at the Chem. Plant
Location: SW Corner TSA.

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
			CME 6				Lean clay with localized coarse lime-stone gravel, (CL), localized abundant MnO, yellow brown, stiff, moist CLAY TILL
		25					
	30						Refusal, T.D. 28.0'. Probably not bedrock! Clay Till too thin. 1300 2/3/99. Grouted hole with 3, 50# bags of Grout. well.

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA 3-7

Project: TCE SOURCE INVESTIGATION	Location: SW CORNER OF TSA (outside fence)		
Coordinates: 104426.30 N, 753645.58 E	Drilling Contractor: GEOTECHNOLOGY		
Drill Make and Model: CME-55 ATV MOUNT	Depth Top of Rock: 37	Depth Casing & Size: NA	Hole Size: 8.5"
Elevation: 664.54'	Angle from Vert. and Bearing: VERTICAL (0°)	Depth Bottom of Hole: 37	
Water Level: NA	Fluid & Additives: NA	Date Start: 2/17/99	Date Finish: 2/17/99	Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME-1	5/5	NA	OL	(0-2) Silty CLAY; blk; sl-med plas; little sand; some clay; damp; firm; org odor; tr fine gtz sand; roots; [TOPSOIL]
	5	5	CME-2	5/5	NA	ML	(2-7.5) Clayey SILT; rd brn; sl plas; little clay; mostly silt; tr vf sand; damp-dry; no odor; Fe Ox stain; firm; loess? ; friable; abundant Fe Ox nods [Roxana Silt]
	10	10	CME-3	5/5	NA	CH	(7.5-20) CLAY; mottled rd brn / lt gry; high plas; tr silt; some clay; tr vf subang gtz; fine sand; occ v weathered granitic pebs; v stiff; damp; no odor; Mn Ox stain; Fe Ox nods; slickensided
	15	15	CME-4	5/5	NA		[Nahrc Ferrelview]
	20	20	CME-5	5/5	NA	CL	(20-26.5) Silty CLAY; rd brn; med plas; some silt; some clay; little vf gtz, subang sand; abundant Mn Ox stain; tr round granitic pebs; firm [CLAY till]
	25	25 30	CME-6	5/5	NA		

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA3-7

Project: TCE SOURCE INVESTIGATION
Location: SW CORNER OF TSA (OUTSIDE FENCE)

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol)
	25	25				CL	See Pg. 1 for description [CLAY TILL]
	30	30	CME-6	5/5	NA	GC	(26.5-37) Clayey GRAVEL; lt.gry-white gravel; rd brn-rd clay matrix; little plas fines; v. dense; gravel is subang chert & ls; damp; p. sorted; weathered; no odor
	35	35	CME-7	5/5	NA		- clay matrix grades to lt.gray & >to 50%
	37	37	CME-8	2/2	NA		[Residuum]
	40						Boring terminated @ 37' bgs due to sampler/auger refusal upon suspected bedrock.
	45						Boring backfilled w/ bentonite slurry upon completion.
	50						Samples collected in 1 gal Ziploc @ 2.5' intervals as composite for PID headspace analysis
	55						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 82
Hole Number: TSA-3-B

Project: TCE at the Chem Plant
Location: Inside the TSA, South end, offset hole ~5' N
Coordinates: 1041321.03N 753708.15E
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. auger
Depth Top of Rock: 31'+
Depth Casing & Size: —
Hole Size: 4¼" / 8¼"
Elevation: 666.95'
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 31'
Water Level: ←
Fluid & Additives: —
Date Start: 1615 2/5/99
Date Finish: 9?? 2/6/99
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (30")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0						Lean clay (CL) mottled orange brown & light brown with FeO nodules, moist, stiff. Reworked Ferrelview at 2.5', dark brown to olive gray, minor gravel FILL
	5.0	0–5.0	CME 1	5.0'			
5	5.0						7.5
	10.0	5.0–10.0	CME 2	5.0'			Silty Lean Clay (CL), mostly light brown, stiff with MnO + FeO nodules, moist Ferrelview Clay Loveland-like
10	10.0						12.5
	15.0	10.0–15.0	CME 3	5.0'			Fat clay (CH), mottled orange brown & light gray with FeO nodules, massive, moist, v. stiff Ferrelview
15	15.0	15.0–20.0	CME 4	5.0'			at 18', mottled reddish brown & light gray, increased MnO.
20	20.0	20.0–25.0	CME 5	5.0'			as above, reddish brown, trace sand + fine gravel. Lower Ferrelview
25	25.0						25'

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-3-B

Project: TCE at the Chem Plant
Location: inside TSA, south end

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		26.0	CME 6	50"			Fat Clay (CH), Minor gravel, ~10% Sand, Mottled yellow brown, black, some light gray, moist, V. stiff. 29-30" abundant MnO CLAY TILL
	30.0	31.0	CME 7				gravelly, light gray, damp
							T.D. 31' 0845 2/6/99 Auger Refusal. Probably Not bedrock, Clay Till too thin. Hole backfilled with Grout well bentonite.
	40						

2/5/99
2/6/99

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Tas 852
Hole Number: TSA-4-1

Project: TCE at the Chem Plant
Location: INside TSA · NE
Coordinates:
Drilling Contractor: Geotech no1094
Drill Make and Model: CME-75 H.S. auge
Depth Top of Rock: 45'
Depth Casing & Size:
Hole Size: 4¼"/8¼"
Elevation:
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 45.5'
Water Level:
Fluid & Additives: None
Date Start: 12:40 2/11/99
Date Finish: 0920 2/12/99
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME 1	5.0			Reworked Ferrelview - Fill 4.0'
	5	5.0	CME 2	5.0'			Lean clay (CL), silty, abundant FeO & MnO, mottled orange brown light brown, minor gray, hard; Ferrelview B: (Roxana-like)
	10	10.0	CME 3	5.0			Fat clay (CH), mottled orange brown and light gray, FeO and MnO nodules, tenacious, v. stiff; Ferrelview as above, mostly orange brown with streaks of light gray, slickensided.
	15	15.0	CME 4	5.0			at 15' mostly light gray with minor orange brown at 17' - MnO streaks appear. Ferrelview 19.0'
	20	20.0					Fat clay (CH) ~ 10% sand; trace fine gravel, orange brown with minor light gray, abundant MnO fractures coating, some FeO nodules, moist v. stiff Clay Till

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-4-1

Project: TCE at the Chem Plant
Location: inside TSA, NE

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		20	CME				Fat clay (CH) ~ 15% sand, trace fine gravel, mostly yellow brown with light gray and black streaks (MNO), moist, v. stiff CLAY TILL
2/11/99			5	5.0'			
	25	25.0					
2/12/99 0800		25.0	CME				CH as above, ~10% gravel.
			6	5.0'			
	30	30.0					
		30.0	CME				CH as above, light gray follows fractures such as slickensides, black MNO coats fractures
			7	5.0'			
	35	35.0					
		35.0	CME				at 32.5', fat clay (CH), red with minor light gray, highly plastic, minor sand moist, v. stiff, likely residuum
			8	5.0'			
	40	40.0					Clayey gravel (GC) angular chert with red highly plastic clay matrix, moist, dense Residuum
2/12/99 0905		40.0	CME				at 40', silty matrix brown to black possibly highly weathered limestone in sampler tip.
			9	4.0'			
		45.0			100/5"		45.5
							weathered limestone
							T.D. 45.5', Refusal on bedrock 0920, 2/12/99. Hole backfilled with Grout Wall bentonite slurry.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP476, Task 15
Hole Number: TSA4-2

Project: TLE SOURCE Investigation	Location: NE CORNER OF TSA
Coordinates: 1041937.33 N, 753876.70 E	Drilling Contractor: GEOTECHNOLOGY

Drill Make and Model:	Depth Top of Rock:	Depth Casing & Size:	Hole Size:
CME-55 ATV MOUNT	-39	NA	8.5"

Elevation:	Angle from Vert. and Bearing:	Depth Bottom of Hole:
661.34	VERTICAL (0°)	39

Water Level:	Fluid & Additives:	Date Start:	Date Finish:	Logger:
NA	NA	2/12/99	2/12/99	N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0–4	CME-1	3.5/4	NO REC FROM 1-1.5'	CL	(0-3.5) Silty CLAY; mottled rd brn & lt gry; high plas; little silt; some clay; tr. vf-m qtz sand; damp; v. stiff; reworked; no odor; MnOx stain; FeOx nods & stain [Ferrelview Fill]
	5	4–9	CME-2	5/5	NA	OL	(3.5-5) silty CLAY; blk; sl-med plas; little silt; some clay; damp; firm; organic odor; tr sand; roots [Remnant Topsoil]
	10	9–14	CME-3	5/5	NA	CH	(5-16.5) CLAY; mottled rd brn & lt gray; high plas; little silt; some clay; tr vf qtz & feld sands; tr. granitic pebs (weathered); v stiff; damp; slickensided; no odor; MnOx stain; FeOx nodules [Native Ferrelview]
	15	14–19	CME-4	5/5	NA		
	20	19–24	CME-5	5/5	NA	CL	(16.5-33) Silty CLAY; rd brn; med plas; some silt; some clay; little vf, qtz, subang sand; tr. high weathered granitic pebs; stiff; damp-dry; no odor;
	25	24–29	CME-6	5/5	NA		- increased MnOx stain & peb content w/ depth

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA4-2

Project: TCE Source Investigation
Location: NE CORNER OF TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	24	CME-6	5/5	NA	CL	See pg 1 for description [CLAY TILL]
	30	29	CME-7	5/5	NA		
		34				GC	(33-40) Clayey Gravel; white & lt. gray gravel; red matrix; little v. plas fines; v. dense; gravel is chert & lp up to 3" rnd's; damp; p. sorted; gravels mod weathered; no odor - matrix from 38-39 is v. lt. gry w/ < chert [Residuum]
	35	34	CME-8	5/5	NA		
		39					
	40	39/40	SS-1	1/1	NA		Boring terminated @ 39' bgs due to auger / sampler refusal upon suspected bedrock. Boring backfilled w/ bentonite slurry upon completion. Samples collected in 1 gal Ziplocs @ 2.5' intervals as composites for PID headspace analysis

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, Task 15
Hole Number: TSA5-1

Project: TCE Source Investigation	Location: Southern end of TSA
Coordinates: 1041575.34 N, 753828.02 E	Drilling Contractor: GEOTECHNOLOGY

Drill Make and Model:	Depth Top of Rock:	Depth Casing & Size:	Hole Size:
CME-55 ATV MOUNT	NA	NA	8.5"

Elevation:	Angle from Vert. and Bearing:	Depth Bottom of Hole:
660.53	VERTICAL (0°)	28.5'

Water Level:	Fluid & Additives:	Date Start:	Date Finish:	Logger:
NA	NA	2/9/99	2/10/99	N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0–3	CME-1	3/3	NA	CL	(0-11.5) Silty CLAY; mottled rd. brn & lt. gray; high plas; little silt; some clay; tr. vf qtz & feldsand; v. stiff; damp; no odor; MnOx stain; FeOx nodules [Native Ferrel view]
	5	3–8	CME-2	5/5	NA		
	10	8–13	CME-3	5/5	NA		
	15	13–18	CME-4	5/5	NA	CL	(11.5-27) Sandy CLAY; rd. brn; med plas; little vf-m qtz & feld sand, subang-subround; some clay; tr. weathered granitic pebs; stiff; damp-dry; no odor; MnOx stain; FeOx nods; weathered [CLAY TILL]
	20	18–23	CME-5	5/5	NA		
	25	23–28	CME-6	5/5	NA		

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP476, TASK 15
Hole Number: TSA5-1

Project: TCE SOURCE Investigation
Location: SOUTHERN END OF TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	23	CME-6	5/5	NA	CL	See pg 1 for description
		28				GC	(27-28.5) Clayey GRAVEL; wh. H'gry chert; ls gravel (up to 3"); little v plas fines; clay matrix is rd brn; v. dense; damp; p. sorted; sub bang - sub round gravel appears mod weathered (Residuum) no odor
		30 28.5	SS-1	0.5/0.5	50+		
	30						Boring terminated @ 28.5' bgs due to auger/sampler refusal upon impenetrable Residuum. TD correlates w/ findings & elevation change w/ respect to TSA 5-2.
	35						Boring backfilled w/ bentonite slurry upon completion
							Samples collected in 1-gal Ziplocs @ 2.5' intervals as composites for PID headspace analysis.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA5-2

Project: TCE Source Investigation	Location: SE Corner Of TSA
Coordinates: 1041471.95N 753832.04E	Drilling Contractor: Geotechnology

Drill Make and Model:	Depth Top of Rock:	Depth Casing & Size:	Hole Size:
CME-55 ATV MOUNT	N/A	NA	8.5"

Elevation:	Angle from Vert. and Bearing:	Depth Bottom of Hole:
662.20'	VERTICAL (0°)	30' bgs

Water Level:	Fluid & Additives:	Date Start:	Date Finish:	Logger:
DRY	NA	2/8/99	2/8/99	N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0 – 3.5	CME-1	3.5/3.5	NA	CL	(0-13.5) Silty CLAY; mottled rd. brn & lt. gray; high plas; little silt; some clay; tr. vf. qtz & feld sands; v. stiff-hard; damp; slickensided; no odor; MnOx stain; FeOx nodules; [Native Ferrelview]
	5	3.5 – 8.5	CME-2	5/5	NA		- < mottling to lt. gray
	10	8.5 – 13.5	CME 3	5/5	NA		-> increasing sand & MnOx w/ depth
	15	13.5 – 18.5	CME-4	5/5	NA	CL	(13.5-28) Silty CLAY; rd brn; med plas; some silt; some clay; little vf, qtz, subang sand; tr., highly weathered granitic pebs; stiff; damp-dry; no odor; abundant MnOx stringers; weathered. [CLAY TILL]
	20	18.5 – 23.5	CME 5	5/5	NA		
	25	23.5 – 28.5	CME-6	5/5	NA		

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK15
Hole Number: TSA5-2

Project: TCE SOURCE INVESTIGATION
Location: SE CORNER OF TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	23.5 – 28.5	CME-6	5/5	NA	CL	(13.5-28) See pg 1 for description
	30	28.5 – 30.0	CME-7	1.5/1.5	NA	GC	(28-30) Clayey Gravel; white - lt gray chert; 1s gravel (up to 3"); little v. plastic fines; clay matrix is red. brn; v. dense; damp; 1 sorted subangular. subround gravel appear mod weathered Residuum
	35						Boring terminated @ 30' bgs due to auger / sampler refusal upon impenetrable Residuum. Boring backfilled w/ bentonite slurry. - Samples collected in 1 gal Ziploc @ 2.5' intervals as composites for on-site PID headspace screening.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-S-3

Project: TCE at the Chem-Plant
Location: inside TSA, SE
Coordinates: 1041339.66N 753831.92E
Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. auger
Depth Top of Rock: Possibly 35'
Depth Casing &/Size: —
Hole Size: 4¼" / 8¼"
Elevation: 666.26'
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 35'
Water Level: —
Fluid & Additives: —
Date Start: 1500 2/10/99
Date Finish: 1615 2/12/99
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
	0	0	CME 1	5.0			Lean Clay (CL), Silty, Mottled orange brn & gray, Moist, Stiff, with 1/4" MnO nodules - Ferrelview Formation-like
	5	5.0	CME 2	5.0			
	10	10.0	CME 3	5.0			9' Fat Clay (CH) Mottled orange brn. & gray, Moist, V. Stiff, Massive, FeO nodules Ferrelview CLAY highly plastic, Slickensided, orange brown & light gray, with 1/16" FeO nodules. Trace white angular Sand -
	15	15.0	CME 4	5.0			Trace fine gravel 19.0'
	20	20.0	CME 5	5.0			Fat Clay, ~15% sand & fine gravel orange brown with light gray & black streaks (MnO), Moist, V. Stiff- CLAY TILL - increase in sand & gravel & MnO.
		25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-5-3

Project: TCE at the Chem Plant
Location: Inside TSA, SE corner

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		25.0	CME 4	5.0'			Pockets of weathered limestone gravel. 27.5'-30.0' - less sand & gravel, highly plastic, slickensided, FeO nodules CLAY TILL
	30	30.0					
		30.0	CME 7	5.0			Fat Clay with gravel pockets orange brown, red, gray black
							34'
	35	35.0					~~Gravel with~~ Clayey Gravel, light gray, Clay highly plastic, Chert & Weathered limestone Probable Residuum
							T.D. 35', refusal. 1615 2/8/99
							hole grouted with Grout Well Bentonite Made by Wyo-Ben. 3, 50# bags mixed with 20-gals water/bag.

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA-S-4

Project: TCE SOURCE INVESTIGATION
Location: SE CORNER OF TSA (outside fence)
Coordinates: 104125.53N, 75385B.47E
Drilling Contractor: GEOTECHNOLOGY
Drill Make and Model: CME-55 ATV MOUNT
Depth Top of Rock: NA
Depth Casing & Size: NA
Hole Size: 8.5"
Elevation: 671.62'
Angle from Vert. and Bearing: VERTICAL (0°)
Depth Bottom of Hole: 40
Water Level: NA
Fluid & Additives: NA
Date Start: 2/17/99
Date Finish: 2/17/99
Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol)
	0	0 / 4	CME-1	2/4	NO REC FROM 0-2'		(0-2) GRAVEL, ls, road bse
	4	4 / 9	CME-2	5/5	NA	CL	(2-5) Silty CLAY; mottled rd brn & lt.gry; high plas; little silt; some clay; tr gty sand; damp; stiff; reworked; no odor; MnOx stain & FeOx nods [Fernvale Fm]
	9	9 / 14	CME-3	5/5	NA	CH	(5-26.5) CLAY; mottled rd brn & lt.gray; high plas; tr. silt; mostly clay; tr vf-med gty sand; v. stiff; damp; slickensided; no odor; MnOx stain; FeOx nods
	14	14 / 19	CME-4	5/5	NA		
	19	19 / 24	CME-5	5/5	NA		
	24	24 / 29	CME-6	5/5	NA		[Native Cornelius]

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA-5-4

Project: TCE SOURCE INVESTIGATION
Location: SE CORNER OF TSA (OUTSIDE

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	24 – 29	CME-6	5/5	NA	CH	See pg. 1 for description [Native Ferrelvrau]
						CL	(26.5-37.5) Silty CLAY; rd brn; med plas; some silt; some clay; little vf qtz; subang sand; tr. high weathered granitic pebs; abundant MnOx stain; no odor; stiff
	30	29 – 34	CME-7	5/5	NA		
	35	34 – 39	CME-8	5/5	NA		[CLAY TILL]
						GC	(37.5-40) Clayey GRAVEL; ltgry subang chert gravel; rd brn clay matrix; little plas fine; v. dense; damp, p. sorted; weathered; no odor [Residuum]
		39 – 40	CME-9	1/1	NA		
	40						Boring terminated @ 40' bgs due to sampler/auger refusal upon impenetrable Residuum.
	45						Boring backfilled w/ bentonite slurry upon completion.
	50						Samples collected in 1 gal Ziplocs @ 25' intervals as composites for PID headspace analysis
	55						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task B52
Hole Number: TSA-C-1

Project: ICE at the Chem Plant
Location: Inside TSA, SE
Coordinates: 1041500.75 N 753936.36 E
Drilling Contractor: Geotech no 1094
Drill Make and Model: CME: 75, H.S. Auger
Depth Top of Rock: 35.0'
Depth Casing & Size: —
Hole Size: 4¼" / 8¼"
Elevation: 665.39
Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 35.5
Water Level: —
Fluid & Additives: —
Date Start: 0750 2/10/99
Date Finish:
Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (30")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		0	CME				Fat clay (CH) mottled orange brown, with minor light gray, minor FeO nodules, more abundant 0-1.5', massive, moist, v. stiff - Ferrel view clay - upper Ferrel view missing.
2800			1	5.0			
	5	5.0					
		5.0	CME				CH as above, from 5'-7.5', predominantly light gray; from 7.5'-10.0' mostly orange brown, slickensided
2805			2	5.0			
	10	10.0					
		10.0	CME				CH as above, trace sand & fine gravel, MnO streaks, slickensided
			3	5.0'			
							14.0'
	15	15.0					Fat Clay (CH), ~20% well graded sand, trace fine gravel, mottled yellow brown and light gray with black streaks (MnO) moist, v. stiff. CLAY TILL
		15.0	CME				
			4	5.0'			As above, from 17.5'-20.0', increase in MnO and gravel, ~10%. MnO more disseminated instead of streaks
	20	20.0					
		20.0	CME				
2830			5	5.0'			As above, damp, with pockets of increased sand and gravel
		25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task B52
Hole Number: TSA-6-1

Project: TCE at the Chem. Plant
Location: Inside TSA, SE

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		25.0	CME 4	5.0'			Fat clay (CH), ~20% sand, ~10% fine to coarse gravel, mottled yellow brown, light gray and black (MnO), damp, V. Stiff CLAY TILL 28.5'
3840		30.0					
	30	30.0	CME 7	5.0'			Fat clay (CH) ~10% sand, minor fine gravel, mottled orange brown, light gray and black, massive, moist, very stiff. Slickensided, FeO nodules. CLAY TILL
							30'-33': as above, reddish brown & light gray, FeO nodules, highly plastic 33.0'
		35.0					Clayey gravel, limestone fragments up to 3", clay matrix highly plastic, light brown to black, moist, Residuum 35.0'
	35		SPT		32/6"		Weathered limestone
							T.D. 35.5', 0900, 2/10/99
							Hole backfilled with Grout Well bentonite slurry
	40						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-6-2

Project: TCE at the Chem. Plant
Location: inside TSA, SE
Coordinates: 104449.67N 753928.54E
Drilling Contractor: Geotech no 109
Drill Make and Model: CME-75 HS. auger
Depth Top of Rock: 34.0'
Depth Casing & Size: —
Hole Size: 4 1/4" / 8 1/4"
Elevation: 664.80'
Angle from Vert. and Bearing: vertical
Depth Bottom of Hole: 34.5'
Water Level: —
Fluid & Additives: —
Date Start: 1520 2/9/99
Date Finish: 1630 2/9/99
Logger: A. Beafer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (3.0")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol)
	0	0	CME 1	5.0'			Fat Clay (CH), orange brown with minor light gray, massive, ~10% FeO nodules (1-2 mm), moist, very stiff, (Roxanna-like missing; cut-?) Farrelview Clay
	5	5.0					at 5', CH as above, mostly light gray with minor orange brown, FeO nodules, slickensided.
835		5.0	CME 2	5.0'			
	10	10.0					CH as above, trace sand and fine gravel, Mostly gray with black streaks (MnO) slickensided at 14' increase in sand, ~10% base Farrelview 15.0'
		10.0	CME 3	5.0'			
	15	15.0					Fat Clay (CH) ~20% sand, ~5% fine gravel, Mostly yellow brown with light gray and black streaks (MnO) damp, V. Stiff - poker chip texture CLAY TILL
		15.0	CME 4	5.0'			
	20	20.0					As above, poker chips, mostly yellow brown, light gray seems to follow fractures (slickensides.?) damp.
1610		20.0	CME 5	5.0'			
	25	25.0					

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ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task B52
Hole Number: TSA-6-2

Project: TCE at the Chem. Plant
Location: Inside TCA, SE

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		25.0	CME 7	5.0'			CH as above.
							27.5 Fat CLAY (CH) trace sand, some FeO nodules, reddish brown with light gray at black following paleo. desiccation fractures, moist, v. stiff, highly plastic - CLAY TILL
30		30.0		4.0'			32.5 Clay w/ gravel, clay matrix highly plastic, light brown to black, moist dense, abundant MnO - Residuum.
		34.0	SPT		30/6"		34.0 Weathered limestone
35							T.D. 34.5 1630, 2/9/99
							hole backfilled with Grout Well bentonite slurry

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: Task 852
Hole Number: TSA-6-3

Project: TCE at the Chem. Plant	Location: inside TSA, SE
Coordinates: 1041409.04N 753933.60E	Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. auger	Depth Top of Rock: 35.0
Depth Casing & Size: —	Hole Size: 4¼"/8¼"
Elevation: 664.25	Angle from Vert. and Bearing: Vertical
Depth Bottom of Hole: 35.5	
Water Level: —	Fluid & Additives: —
Date Start: 1250 2/9/99	Date Finish: 1415 2/9/99
Logger: A. Benfer	

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (30")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		0	CME 1	5.0'			Fat Clay (CH) mottled orange brown + light gray, minor FeO nodules (~1/16") massive, moist, very stiff. (Roxanna-like missing, probably cut area) Ferrelview Clay
	5	5.0 / 5.0	CME 2	5.0'			Fat Clay (CH) as above, slickensided
	10	10.0 / 10.0	CME 3	5.0'			As above with trace of white angular sand grains, basal Ferrelview 12-14.5' mostly gray
	15	15.0 / 15.0	CME 4	5.0			15.5' Fat Clay (CH) with ~15% sand, yellow brown with minor light gray and black streaks (MnO), moist very stiff some fine gravel. CLAY TILL at 18'; increase in sand + grvl.
	20	20.0 / 20.0	CME 5	5.0'			Fat clay as above, slight increase in sand and fine gravel, also MnO. CLAY TILL
	25	25.0					

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-6-3

Project: TCE at the Chem. Plant
Location: Inside TSA, SE

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
		25.0	CME 6	5.0'			Fat Clay as above -
	30	30.0					cf 28', Fat Clay (CH), reddish brown with minor light gray, FeO nodules, minor sand and gravel, some MnO streaks - CLAY TILL (Very similar to Ferrelview - 1 & Clay Till).
		30.0	CME 7	5.0'			
							32.0' Clay Gravel (GC) well graded, Clay (CH), yellow brown to black, moist, dense Residuum 35.0'
	35	35.0	SPT		30/5"		Weathered Limestone
							T.D. 35.5', 1415, 2/9/99
							Hole backfilled with Grout Well bentonite slurry
	40						

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: TASK 852
Hole Number: TSA-64

Project: TCE at the Chem Plant	Location: Inside TSA
Coordinates: 104139.07N 753933.60E	Drilling Contractor: Geotechnology
Drill Make and Model: CME-75 H.S. auger	Depth Top of Rock: 35.0' / Depth Casing & Size: — / Hole Size: 4¼" / 8¼"
Elevation: 664.48'	Angle from Vert. and Bearing: Vertical / Depth Bottom of Hole: 35.5
Water Level: —	Fluid & Additives: — / Date Start: 0815 2/9/99 / Date Finish: 1620 2/9/99 / Logger: A. Benfer

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER (30")	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	0	0	CME 1	5.0'	5		Fat Clay (CH), orange brown with minor light gray, some FeO nodules, moist, V. stiff, massive. Ferrelview. Upper Ferrelview missing.
	5	5.0	CME 2	5.0'			As above. 7.5-10.0' - gray.
	10	10.0	CME 3	5.0'			Fat Clay, gray, trace white sand, trace fine gravel, moist V. stiff. Ferrelview.
	15	15.0	CME 4	5.0			16.0' Fat Clay, ~20% well graded sand, ~10% fine gravel, yellow brown with some light gray & black (MnO) moist, V. stiff, CLAY TILL
0900	20	20.0	CME 5	5.0'			As above, slight increase in sand and gravel, gravel up to 1½". increase in MnO.
0905	25	25.0					

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: Task 852
Hole Number: TSA-6-4

Project: TCE at the Chem Plant
Location: Inside TSA, SE

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
		25.0	CME 6	50'			Fat Clay (CH) pockets of well graded sand, some gravel, fine to 1", Zones of abundant FeO nodules, some MnO, yellow brown to reddish brown, moist, V. Stiff - CLAY TILL
	30	30.0					
0915		30.0	CME 7	50'			Fat Clay (CH) reddish brown, minor light grayish black, ~15% sand & gravel, some FeO nodules, CLAY TILL
							33.0
	35	35.0					Gravelly Clay, yellow brown + black, highly plastic Residual - CH at 35', drove SPT to verify bedrock: SPT refusal, weathered limestone in tip.
							T.D. 35.5' 0920, Limestone bedrock. 2/9/99. Hole grouted with Grout Well bentonite slurry
	40						1, 50# bag / 26 gals water

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ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 1
Project Number: WP-476, Task 15
Hole Number: TSA6-5

Project: TCE Source Investigation	Location: SE CORNER OF TSA
Coordinates: 104322.18N 753933.63E	Drilling Contractor: GEOTECHNOLOGY
Drill Make and Model: CME-55 ATV-MOUNT	Depth Top of Rock: NA; Depth Casing & Size: NA; Hole Size: 8.5"
Elevation: 666.57'	Angle from Vert. and Bearing: VERTICAL (0°); Depth Bottom of Hole: 28
Water Level: NA	Fluid & Additives: NA; Date Start: 2/9/99; Date Finish: 2/9/99; Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION
	0	0 – 3	CME-1	3/3	NA		Boring colocated ~5' North of TSA6-6. Lithology / contacts were compared to TSA6-6 lith log. Lith / contacts correlate exactly ∴ description from TSA6-6 should be referenced for this boring. No odor present during sampling
	5	3 – 8	CME-2	5/5	NA		
	10	8 – 13	CME-3	5/5	NA		
	15	13 – 18	CME-4	5/5	NA		Samples collected in 1-gal Ziploc @ 2.5' intervals as composites for PID headspace analysis
	20	18 – 23	CME-5	5/5	NA		Boring backfilled w/ bentonite slurry upon completion
	25	23 – 28	CME-6	0/5	NA		Boring terminated @ 28' bgs due to loss of sampler. Hole was abandoned after numerous attempts to retrieve sampler within HSAs. Sampler retrieved after removing entire string of HSAs.

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet 1 of 2
Project Number: WP-476, TASK 15
Hole Number: TSA6-6

Project: TCE SOURCE INVESTIGATION	Location: SE CORNER OF TSA
Coordinates: 1041314.97N 753934.44E	Drilling Contractor: GEOTECHNOLOGY
Drill Make and Model: CME-55 ATV MOUNT	Depth Top of Rock: 36' bgs; Depth Casing & Size: NA; Hole Size: 8.5"
Elevation: 667.15	Angle from Vert. and Bearing: VERTICAL (0°); Depth Bottom of Hole: 36' bgs
Water Level: NA	Fluid & Additives: NA; Date Start: 2/8/99; Date Finish: 2/9/99; Logger: N. BOSS

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION (Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol)
	0	0 – 3	CME-1	3/3	NA	CL	(0-5) Silty CLAY; mottled rd brn & lt. gray; high plas; little silt; some clay; tr. vf gty & feld sand; v. stiff; tr. sub rnd fine to gravel; damp; reworked (compressed); no odor; Mn Ox stain; Fe Ox nodules; [Ferrelview Fill] - from 4-5' - grn gry w/ sl odor (organic)
	3	3 – 8	CME-2	5/5	NA		
	5						
	8	8 – 13	CME-3	3/5	NA	CL	(5-15) Silty CLAY; mottled rd brn & lt gry; high plas; little silt; some clay; tr. vf gty; feld sand; v. stiff; ~~tr subang fine to coarse gravel~~; damp; no odor; Mn Ox stain; Fe Ox nodules; [Ferrelview (Native)]
	10						- decreasing mottling to lt gry only
	13	13 – 18	CME-4	5/5	NA		
	15						
	18	18 – 23	CME-5	5/5	NA	CL	(15-33) Silty CLAY; rd. brn; med plas; some silt; some clay; little vf, gty, subang sand; tr. highly weathered granitic pebs; stiff; damp; no odor; Mn Ox stain; weathered [CLAY TILL]
	20						
	23	23 – 28	CME-6	5/5	NA		
	25						

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MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP

BOREHOLE LOG

Sheet: 2 of 2
Project Number: WP476, Task 15
Hole Number: TSA6-6

Project: TCE SOURCE INVESTIGATION
Location: SE Corner of TSA

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE & NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SYMBOLIC LOG	SOIL DESCRIPTION: Name, Gradation or Plasticity, Particle Size Distribution, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy, USCS Group Symbol
	25	23 – 28	CMG-6	5/5	NA	CL.	(15-33) See pg 1 for description
	30	28 – 33	CMG-7	5/5	NA		
	35	33 – 36	CMG-8	3/3	NA	GC	(33-36) Clayey GRAVEL; white - H gray chert; L gravel (up to 3"); little v. plas fines; clay matrix is red brn; v. dense; damp; p. sorted; subang - subroud gravel appear mod weathered [Residuum]
							@ 36' Limestone; H gray (N6); sl. fossiliferous; sl. weathered; fine-grained; high porous; high reac to HCl; mod - hard [Burlington - Keokuk?]
	40						Boring terminated @ 36' bgs due to refusal upon confirmed bedrock. Boring backfilled w/ bentonite slurry.
							- Samples collected in 1 gal Ziplocs @ 2.5' intervals as composites for on-site PID head space screening.