Appendix T

Clay Borrow Source Quality Information

T-1 – Clay Borrow Source A Information
T-2 – Clay Borrow Source B Information
T-3 – Updated Isopach Maps for Clay Borrow Areas

T-1 – Clay Borrow Source A Information

park or natural area. The balefill itself should remain undeveloped, as the side slopes and unstable fill would preclude its use for agriculture or residential construction.

7.0 IDENTIFICATION/CHARACTERIZATION OF BORROW SOURCES

7.1 General Information

7.1.1 Location

Vernon County intends to continue using materials from the balefill property for daily cover and for the construction of the final cover system (note that the proposed vertical expansion would not require the construction of any additional liner beneath the waste). Therefore, the location of the proposed borrow sources is the same as that of the proposed balefill expansion:

> The SE ¼ of the SW ¼, the SW ¼ of the SE ¼, the SE ¼ of the SE ¼, the S ½ of the NW ¼ of the SE ¼, and the E ½ of the NE ¼ of the SW ¼ all in Section 15, Township 13 North, Range 4 West, Town of Viroqua, Vernon County, Wisconsin.

The property, which encompasses 253 acres, is already owned by Vernon County.

7.1.2 Present Land Uses

The proposed site is already used for a balefill and a construction/demolition wastes landfill. Land use within one mile of the proposed fill limits is primarily agricultural. To the west and south of this site, most land is in crops or pasture. Wooded land to the northeast is used for timber and private hunting. The Vernon County Solid Waste Management Plan indicates that there are no scientific or natural areas, State parks, or County forest lands within several miles of the property under consideration.

7.1.3 Transportation Routes

Because the borrow sources would be located on the same property as the proposed balefill expansion, the hauling of daily cover and liner system construction materials would not involve the use of any public roads as transportation routes.

7.1.4 Access Restrictions

Because the borrow sources would be located on the same property as the proposed balefill expansion, there would be no access restrictions to obtaining materials for daily cover and liner system construction.

7.1.5 Hydrologic Features

The proposed borrow source property is situated mostly along the top of a ridge between Seas Branch and an intermittent tributary to Seas Branch (see Plan Sheet 3). Consequently, there are no permanent surface water features present at the site. The natural topography directs runoff either to the north (into Seas Branch valley) or to the southwest (into the intermittent stream). Ultimately, all runoff from the site enters Seas Branch, which is impounded by an artificial dam located roughly one mile northeast of the site (see Plan Sheet 3). Approximately two miles downstream from this dam, Seas Branch joins the West Fork Kickapoo River.

There are no wetlands within at least one mile of the proposed site, but springs sometimes occur along valley walls of the larger streams. One such spring (Crume Spring) occurs less than 1,500 feet north of northernmost property border, across Seas Branch valley (see Plan Sheet 3). Springs in this setting are the result of perched groundwater reaching the land surface along lowly permeable shale beds within the Prairie du Chien Group.

7.1.6 Natural or Historical Areas

A letter from the WDNR Bureau of Endangered Resources iondicates that there are no endangered resources and no environmentally unique areas within Section 15 of T13N, R4W (see Appendix G). Correspondence from the WDNR State Archaeologist also indicates that no known archaeological or historical sites exist on the property (see Appendix H). It should be noted that an archaeological survey of the site was undertaken by Joyce McKay of Cultural Resources Consultants in 1988 as part of the feasibility study for the existing sanitary balefill. McKay's report concluded that "no significant prehistoric or historic occupation" occurred within the proposed fill area (see Appendix H).

7.1.7 Initial Site Inspection

The proposed borrow site was visited by Mr. Michael C. Degen, WDNR solid waste specialist, on July 16, 1987.

7.2 Field and Lab Investigations

7.2.1 Test Pits

On October 19, 1989, a qualified representative from CWEA supervised the excavation of 29 test pits in the proposed clay borrow source area. This area encompasses approximately 25 acres within the balefill property and includes most of the balefill waste limits. The 29 test pits used to characterize the clay borrow source exceeds the minimum number required by s. NR 512.15(2)(a) for a 25-acre area (the minimum number is 17 test pits). In addition, the information obtained from several test borings (TB-4, TB-5, TB-6, TB-7, TB-8, TB-11, and TB-12) and auger borings was used to construct a clay isopach map. The locations of test pits (which were spaced between 100 and 200 feet apart) are shown on Plan Sheets 25 and 26.

The depths of test pit excavation varied between 5 and 14 feet, with most pits extending to 8 or 9 feet below land surface (see Appendix Z for test pit logs). Each major unit encountered in these pits was described based on field observations and the results of analyzing samples in the laboratory.

7.2.2 Soil Samples

A total of 45 samples from 18 test pits were analyzed for grain size distributions and Atterberg limits. Eight samples (each from a different pit) were also submitted for five-point modified Proctor tests and falling-head permeability tests. The results from all laboratory analyses conducted on test pit soil samples are contained in Appendix Z.

7.2.3 Results of Investigation

The surficial geologic materials encountered in test pits are the same as those previously described under Section 4.0 (Subsurface Data Analysis). The upper 14 feet of subsurface material exposed in test pits includes loess (wind blown deposits of silt and clay) and weathered bedrock residuum.

Appendix Z contains a table that summarizes the results of laboratory analyses. This table shows that all but four of the 45 samples submitted for grain size distribution analysis met the s. NR 504.06(2)(a) requirement of having at least 50 percent by weight pass the 200 sieve (the average P-200 for all samples is 82.8 percent, and the average clay content is 31.3 percent). Three of the four samples that did not meet this standard were collected from the bottom of a test pit, beneath the layer of acceptable clay material.

The results of the Atterberg limits tests showed that all samples with greater than 50 percent P-200 had a liquid limit greater than 25 percent (the average is 55.1 percent) and a plasticity index greater than 12 percent (the average is 21.1 percent). This exceeds the requirements of s. NR 504.06(2)(a)3 and 4 for clay used in landfill liners.

The eight samples submitted for Proctor tests (ASTM D1557-78, Method A) revealed maximum dry densities that range between 109 and 118 lbs/ft^3 (average of 114.5 lbs/ft^3) and optimum moisture contents that vary from 13 to 19 percent (average of 16.2 percent). Falling-head permeability tests conducted on two of these samples yielded saturated hydraulic conductivity values that range between $9.47X10^{-9}$ and $1.03X10^{-8}$ cm/sec. These results exceed the minimum requirements of s. NR 504.06(2)(a)2.

7.3 Data Presentation

7.3.1 Volume of Acceptable Clay

An estimate of clay volume that can be excavated from the proposed borrow site was made based on an isopach map showing the thickness of acceptable material (see Plan Sheet 25). This map indicates that clay extends over an area of approximately 25 acres and includes roughly 315,300 cubic yards of clay; however, some of this material has already been excavated and stockpiled onsite during Phase I and Phase II construction. The total volume of clay required to cap the existing facility is 32,300 cubic yards. The proposed vertical expansion will increase that volume by 500 cubic yards, bringing the total clay volume required to 32,8000 cubic yards.

7.3.2 Clay Separation Methods

A methodology for separating acceptable from unacceptable soil material is required by s. NR 512.15(3)(d). When the clay that is already stockpiled onsite was excavated, a technician from CWEA was present to supervise the process. The decision to accept or reject excavated soil was made based on visual inspection in the field; however, samples were collected periodically for lab analyses to provide quality control on the technician's judgment. This same procedure will be used in the future as additional material is excavated in the Phase III area.

7.3.3 Abandonment

Plan Sheet 26 shows the proposed final grades for the borrow source area after the required clay has been excavated.

8.0 ENVIRONMENTAL REVIEW

8.1 Project Summary

8.1.1 Overview

Vernon County owns and operates a municipal solid waste balefill and a construction/demolition waste landfill on a property located in the Town of Viroqua (see Plan Sheet 1). Because both of these facilities are expected to reach capacity within five years, the Vernon County Solid Waste Planning Committee began studying the county's future waste disposal options in 1999. That process culminated in a revised solid waste management plan which identified vertical expansion of the existing balefill as the most cost-effective option to meet future waste disposal needs. The proposed balefill expansion would have a capacity of 165,000 tons, brining the total balefill capacity to 352,000 tons. It is anticipated that the added capacity would extend the balefill's life by roughly six years (through 2016).

8.1.2 ISR Opinion Letter

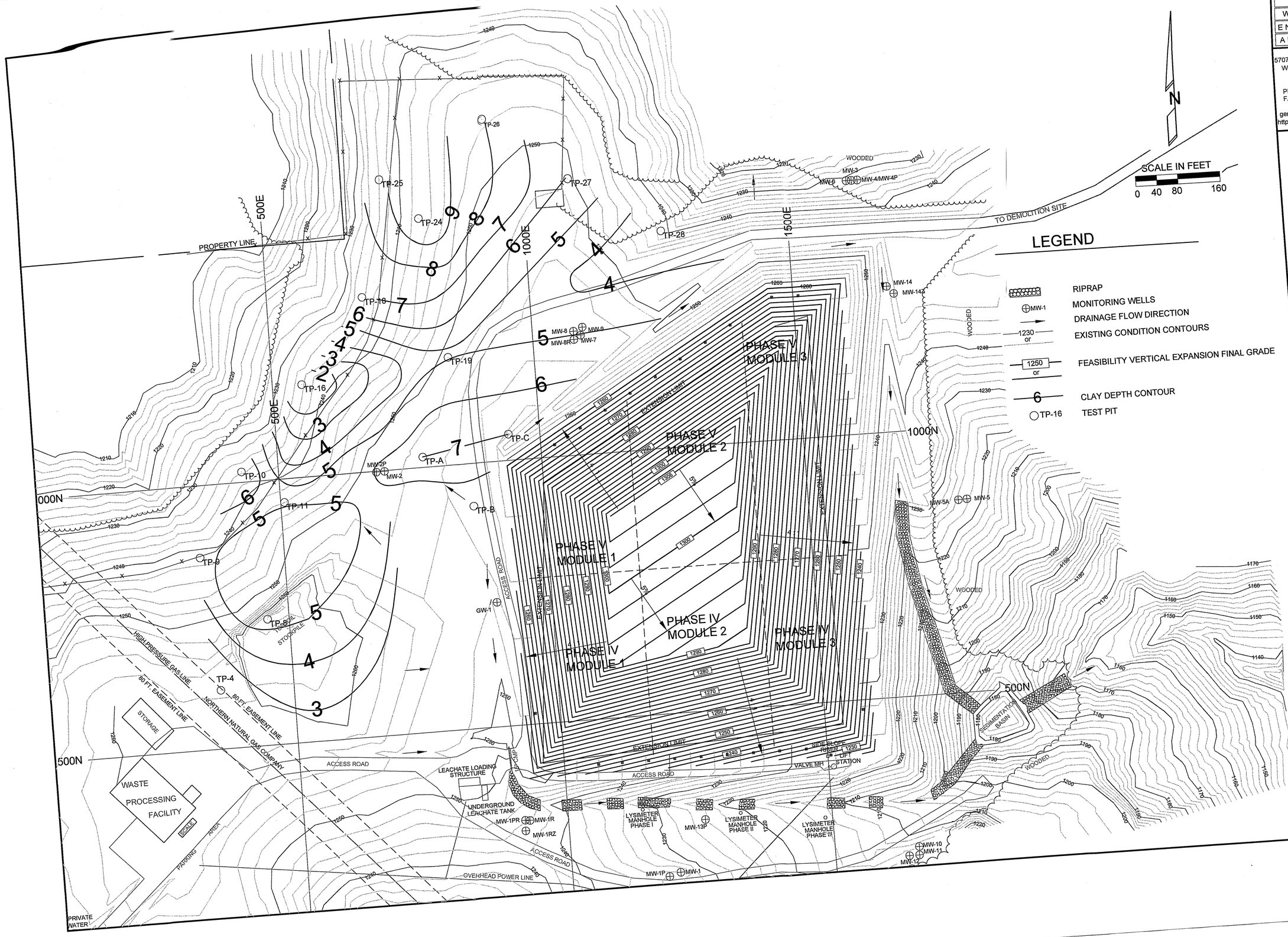
The site of the proposed vertical expansion was visited by WDNR waste program manager David Lundberg on May 22, 2002, who found no obvious violations of the locational criteria in s. NR 504.04(3) or of the performance standards in 504.04(4)(a) through (c). An initial site report was then submitted in July 2002, and the Department issued a favorable opinion of the site's potential for a vertical expansion on October 23, 2002 (see Appendix C).

8.1.3 Authority and Permits

The Vernon County Solid Waste Management Committee was created in June 1986 by action of the County Board. In accordance with Section 59.07(135) of the Wisconsin Statues, this committee has the authority to establish operations and methods of waste management as are deemed appropriate, including landfills. The licensing process being followed for this proposed balefill vertical expansion is in accordance with Wisconsin Statutes Chapter 289, which requires that an initial site report and a feasibility report be submitted to the WDNR for approval. The applicable WDNR requirements for these reports are contained in ch. NR 509 and 512 of the Wisconsin Administrative Code.

The proposed balefill construction and borrow source excavation will not disturb any wetlands, so s. NR 1.95 and s. NR 299 do not apply, nor will a U.S. Army Cops of Engineers 404 permit be required. Likewise, this project will have no effect on navigable waters, so Wisconsin Statutes Chapter 30 are not applicable. However, because balefill construction and borrow source excavation create point sources of construction site stormwater discharge, it is necessary to meet the applicable requirements of s. NR 216.

As discussed in Section 5.4.1, exceedances of the s. NR 140 groundwater quality standards for fluoride, iron, manganese, and nitrate+nitrite have been detected during baseline monitoring.



CWEA
CENTRAL WISCONSIN ENGINEERS & ARCHITECTS
5707 SCHOFIELD AVENUE
WESTON, WISCONSIN
54476
PHONE: (715) 359-9400
FAX: (715) 355-4199
general@cwengineers.com
http://www.cwengineers.com

PROJECT:

CLAY ISOPACH MAP
FOR CLAY COVER

VERNON COUNTY SANITARY BALEFILL
INITIAL SITE REPORT FOR VERTICAL EXPANSION

REVISIONS:

DRAWN BY: D.H.

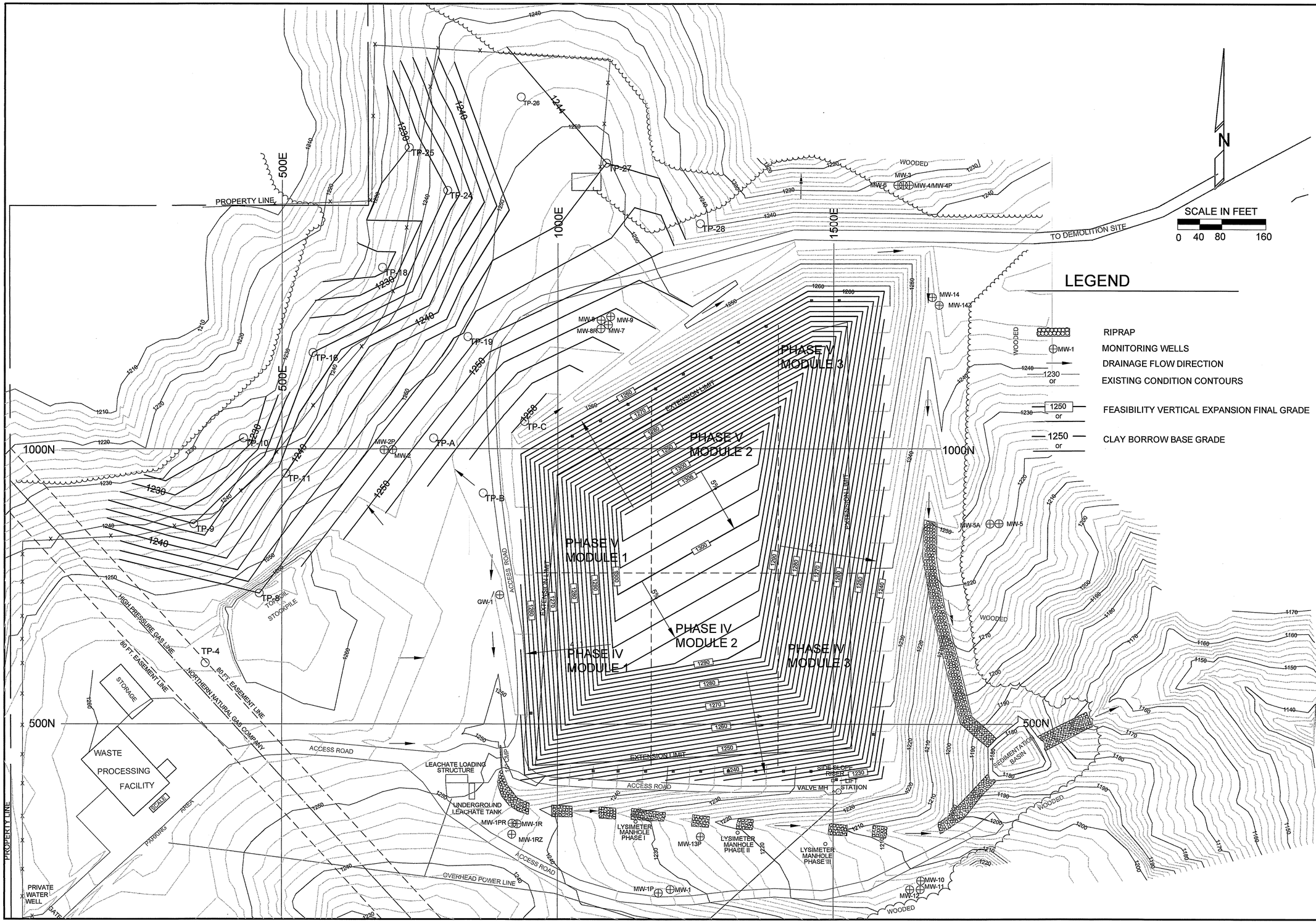
CHECKED BY: D.P.

APPROVED BY: D.O.

DATE: AUG 2003

SHEET: 25 OF 31

\DRAFT\9460000 VERNON CO BALEFILL\ALT CLOSURE.dwg, ISOPACH, 09/21/2003 11:45:17 AM



CWEA
CENTRAL WISCONSIN ENGINEERS & ARCHITECTS

5707 SCHOFIELD AVENUE
WESTON, WISCONSIN
54476

PHONE: (715) 359-9400
FAX: (715) 355-4199

general@cwengineers.com
http://www.cwengineers.com

PROJECT:

CLAY BORROW SITE FINAL GRADES
VERNON COUNTY SANITARY BALEFILL
INITIAL SITE REPORT FOR VERTICAL EXPANSION

REVISIONS:

DRAWN BY: D.H.

CHECKED BY: D.P.

APPROVED BY: D.O.

DATE: AUG 2003

SHEET: 26 OF 31

P:\DRAFT\9460000 VERNON CO BALEFILL\ATCLOSURE.dwg, CLAY BORROW, 09/21/2003 11:42:17 AM

APPENDIX Z

Soil Laboratory Analyses for Clay Borrow Source

Central Wisconsin
Engineers

P. O. BOX F • SCHOFIELD, WI 54476 • (715) 842-9500

FINAL TEST INFORMATION

PROJECT: Vernon County Clay Search JOB NO. 70389 DATE 10/19/89

Boring No.	Sample No.	Depth	Field Class	GRADATION - % PASSING									LL	PI	USCS	Wn %	e	Yd P.C.F.	GS	k -(CM/S)
				.005	.02	.200	100	#40	#10	#4	3/8"	3/4"								
TP-7	S1-7	1.5'-2'		28.0	58.0	99.53	100%	100%	100%	100%	100%	100%	37.7	19.4	CL					
	S2-7	3'-4.5'		26.0	50.0	88.58	89.72	96.06	98.79	99.39	100%	100%	35.0	15.22	CL					
	S3-7	6'-8'		50.0	65.0	78.53	81.07	92.06	94.02	94.49	94.72	100%	56.0	29.91	CH					
TP-8	S1-8	3'-4'		25.0	52.0	98.25	98.71	100%	100%	100%	100%	100%	39.6	16.8	CL					
	S2-8	5'-5.5'		26.0	38.0	52.8	58.57	85.3	90.65	92.73	95.58	100%	42.3	23.52	CL					
	S3-8	6'-7'		25.0	49.0	95.3	96.41	98.30	99.38	100%	100%	100%	54.8	29.37	CH					
TP-9	S2-9	3'-4'		20.0	41.0	73.53	75.95	88.48	94.65	96.9	100%	100%	37.0	17.27	CL					
	S3-9	5'-6'		40.0	56.0	72.87	76.75	88.26	93.43	94.79	96.76	100%	54.5	27.99	CL					
TP-10	S1-10	2'-3'		27.0	56.0	98.71	100%	100%	100%	100%	100%	100%	40.0	18.1	CL					
	S2-10	6'-7'		29.0	36.0	43.54	45.58	76.81	98.54	99.0	100%	100%	48.9	24.32	CL					
	S3-10	9'-10'		68.0	84.0	96.89	97.49	99.43	100%	100%	100%	100%	113.5	56.36	Pt					
TP-11	S1-11	1'-2'		27.0	54.0	94.5	95.37	97.23	98.42	99.17	100%	100%	39.5	16.55	CL					
	S2-11	3.5'-4'		42.0	53.0	73.59	77.18	92.57	96.34	97.39	98.36	100%	47.8	25.92	CL					
	S3-11	6'-7'		—	—	33.55	35.27	72.49	98.73	99.48	100%	100%	—	—						
TP-13	S1-13	2'-3'		26.0	54.0	99.45	100%	100%	100%	100%	100%	100%	42.2	17.99	CL					
	S2-13	5'-6'		39.0	58.0	78.43	81.61	95.46	98.83	99.17	100%	100%	58.8	31.62	CH					
TP-14	S2-14	4'-5'		27.0	53.0	99.47	100%	100%	100%	100%	100%	100%	36.8	15.36	CL					
	S3-14	7'-8'		23.0	52.0	98.42	100%	100%	100%	100%	100%	100%	40.5	17.51	CL					
	S4-14	9'-10'		31.0	41.0	61.63	60.38	88.76	94.87	95.99	97.58	100%	42.7	21.18	CL					
TP-15	S1-15	1'-2'		27.0	58.0	99.63	100%	100%	100%	100%	100%	100%	41.4	16.27	CL					
	S2-15	3'-4'		22.0	52.0	99.56	100%	100%	100%	100%	100%	100%	38.3	17.03	CL					
	S3-15	8'-9'		—	—	29.12	36.90	90.37	99.02	99.17	100%	100%	—	—	—					
TP-20	S1-20	2'-3'		26.0	53.0	99.77	100%	100%	100%	100%	100%	100%	36.3	15.12	CL					
	S2-20	4'-5'		27.0	56.0	99.71	100%	100%	100%	100%	100%	100%	41.5	18.19	CL					

Central Wisconsin
Engineers

P. O. BOX F • SCHOFIELD, WI 54476 • (715) 842-9500

FINAL TEST INFORMATION

PROJECT: Vernon County Clay Search JOB NO. 70389 DATE 10/19/89

Boring No.	Sample No.	Depth	Field Class	GRADATION - % PASSING									LL	P1	USCS	Wn %	M %	D.D. P.C.F.	GS	k -(CM/S)
				.005	.02	.200	100	#40	#10	#4	3/8"	3/4"								
TP-20	S3-20	8'-9'		16.0	54.0	99.70	100%	100%	100%	100%	100%	100%	36.5	15.05	CL		26.8			
	S4-20	10'-11'		39.0	51.0	61.21	66.18	93.35	99.50	99.65	100%	100%	45.0	23.33	CL					
TP-21	S1-21	2'-3'		30.0	60.0	99.73	100%	100%	100%	100%	100%	100%	41.3	19.31	CL					
	S2-21	6'-7'		28.0	56.0	99.64	100%	100%	100%	100%	100%	100%	37.4	15.39	CL					
	S3-21	10'-11'		32.0	47.0	59.81	64.32	84.52	93.74	94.81	95.94	100%	55.5	30.8	CH					
TP-22	S1-22	3'-4'		19.0	55.0	99.81	100%	100%	100%	100%	100%	100%	38.8	15.58	CL		23.3			
	S3-22	9'-10'		36.0	58.0	75.36	78.07	93.44	97.83	98.99	100%	100%	49.5	23.56	CL		25.2			
TP-25	S1-25	1.5'-2.5'		25.0	52.0	98.09	98.4	98.94	99.5	100%	100%	100%	38.3	15.45	CL					
	S2-25	4'-5'		57.0	72.0	78.85	81.25	92.66	98.97	100%	100%	100%	63.6	35.71	CH					
TP-27	S1-27	1.5'-2.5'		27.0	52.0	98.95	99.26	99.49	99.66	99.79	100%	100%	40.5	17.6	CL		21.5			
	S2-27	4'-5'		50.0	68.0	84.04	86.28	95.59	98.59	99.56	100%	100%	65.0	32.55	CH		21.1			
	S3-27	7'-9'		—	—	32.24	41.38	83.5	100%	100%	100%	100%	—	—	—		20.1			
TP-A	S1-A	4'-5'		54.0	73.0	91.49	92.16	98.1	99.29	99.58	100%	100%	62.8	32.36	CH					
	S2-A	7'-8'		50.0	63.0	78.64	80.61	93.6	98.64	100%	100%	100%	58.2	30.99	CH					
TP-B	S1-B	3'-4'		34.0	59.0	96.40	96.99	98.12	98.68	99.04	100%	100%	38.9	16.38	CL					
	S2-B	5'-6'		39.0	51.0	73.09	76.61	94.61	99.69	100%	100%	100%	45.3	22.72	CL					
	S3-B	8'-9'		69.0	73.0	84.76	87.24	96.74	99.09	99.46	100%	100%	63.5	32.48	CH		18.0			
TP-C	S1-C	3'-3.5'		26.0	54.0	99.46	100%	100%	100%	100%	100%	100%	34.9	15.09	CL					
	S2-C	5'-6'		30.0	57.0	99.0	100%	100%	100%	100%	100%	100%	43.8	20.78	CL		19.9			
	S3-C	7'-8'		42.0	51.0	60.91	64.92	88.51	93.51	94.92	97.7	100%	54.2	28.7	CL					
TP-D	S1-D	3'-4'		24.0	51.0	98.94	99.16	100%	100%	100%	100%	100%	41.1	16.23	CL					
TP-12	S2-12																22.7	104.65		9.47×10^{-9}
TP-12	S2-12																24.8	100.24		7.79×10^{-9}
TP-12	S2-12																18.64	109.74		2.66×10^{-8}
TP-12	S2-12																15.89	107.43		1.03×10^{-8}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 70389

Sample No.: S2-12 (Proctor Case Test #1)

Sample Description: Clay

Sample Diameter: 5.4 cm

Sample Height (L): 6.8 cm

Sample Area (A): 22.89 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 107.43 pcf

Moisture Content (Initial): 15.89%

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h_f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	64,800	193.1	192.8	1.26×10^{-8}
2	108,000	192.8	192.6	5.05×10^{-9}
3	86,400	192.6	192.1	1.58×10^{-8}
4	68,400	192.1	191.9	8.00×10^{-9}
		Ave. K_T =		1.03×10^{-8}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 70389

Sample No.: S2-12 (Proctor Case Test #2)

Sample Description: Clay

Sample Diameter: 5.8 cm

Sample Height (L): 7.2 cm

Sample Area (A): 26.40 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 109.74

Moisture Content (Initial): 18.64

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h_f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	72,000	187.5	186.4	3.94×10^{-8}
2	108,000	186.4	184.3	5.06×10^{-8}
3	86,400	184.3	184.0	9.10×10^{-9}
4	68,400	184.0	183.8	7.67×10^{-9}
		Ave. K_T =		2.66×10^{-8}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 70389

Sample No.: S2-12 (Proctor Case Test #3)

Sample Description: Clay

Sample Diameter: 5.7 cm

Sample Height (L): 7.3 cm

Sample Area (A): 25.5 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 104.65

Moisture Content (Initial): 22.71%

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h_f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	72,000	194.8	194.5	1.08×10^{-8}
2	108,000	194.5	194.1	9.65×10^{-9}
3	86,400	194.1	193.9	6.04×10^{-9}
4	68,400	193.9	193.6	1.14×10^{-8}
		Ave. K_T =		9.47×10^{-9}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 70389

Sample No.: S2-12 (Proctor Case Test #4)

Sample Description: Clay

Sample Diameter: 5.7 cm

Sample Height (L): 7.2 cm

Sample Area (A): 25.5 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 100.24

Moisture Content (Initial): 24.8%

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h_f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	72,000	193.1	193.0	3.59×10^{-9}
2	108,000	193.0	192.7	7.19×10^{-9}
3	86,400	192.7	192.4	9.01×10^{-9}
4	68,400	192.4	192.1	1.14×10^{-8}
		Ave. K_T =		7.79×10^{-9}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 703

Sample No.: S-8 Proctor Case Test No. 2

Sample Description: Clay

Sample Diameter: 5.9 cm

Sample Height (L): 7.0 cm

Sample Area (A): 27.33 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 116.92 pcf

Moisture Content (Initial): 12.38%

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h^f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	90000	192.4	191.5	2.36×10^{-8}
2	83400	191.5	190.9	1.70×10^{-8}
3	85800	190.9	190.2	1.94×10^{-8}
4	86700	190.2	189.4	2.20×10^{-8}
5	261600	189.4	187.3	1.93×10^{-8}
6	89100	187.3	186.8	1.36×10^{-8}
7	86400	186.8	186.4	1.12×10^{-8}
8	102600	186.4	185.8	1.42×10^{-8}
9	86400	185.8	185.0	2.26×10^{-8}
			Ave. K_T	1.81×10^{-8}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 703

Sample No.: S-8 Proctor Case Test No. 3

Sample Description: Clay

Sample Diameter: 5.6 cm

Sample Height (L): 6.6 cm

Sample Area (A): 24.62 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 117.92 pcf

Moisture Content (Initial): 13.21%

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h_f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	90000	192.0	191.5	1.37×10^{-8}
2	83400	191.5	191.3	5.94×10^{-9}
3	89800	191.3	190.8	1.44×10^{-8}
4	86700	190.8	190.5	8.61×10^{-9}
5	261600	190.5	189.5	9.54×10^{-9}
6	89100	189.5	189.4	2.81×10^{-9}
7	86400	189.4	189.1	8.70×10^{-9}
8	102600	189.1	188.8	7.34×10^{-9}
9	86400	188.8	188.4	1.16×10^{-8}
			Ave. K_T	9.18×10^{-9}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 703

Sample No.: S-8 Proctor Case Test No. 4

Sample Description: Clay

Sample Diameter: 5.8 cm

Sample Height (L): 7.0 cm

Sample Area (A): 26.41 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 114.13 pcf

Moisture Content (Initial): 17.23%

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h_f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	90000	196.6	196.0	1.59×10^{-8}
2	83400	196.0	195.4	1.72×10^{-8}
3	85800	195.4	194.7	1.96×10^{-8}
4	86700	194.7	194.0	1.11×10^{-8}
5	261600	194.0	192.8	1.11×10^{-8}
6	89100	192.8	192.4	1.09×10^{-8}
7	86400	192.4	191.9	1.41×10^{-8}
8	102600	191.9	191.4	1.19×10^{-8}
9.	86400	191.4	190.8	1.70×10^{-8}
			Ave. K_T	1.52×10^{-8}

FALLING HEAD PERMEABILITY TEST

Project: Vernon County

Project No.: 703

Sample No.: S-8 Proctor Case Test No. 5

Sample Description: Clay

Sample Diameter: 5.7 cm

Sample Height (L): 6.5 cm

Sample Area (A): 25.5 cm^2

Standpipe Area (a): 1.77 cm^2

Dry Density: 101.54 pcf

Moisture Content (Initial): 22.91%

$$K_T = \frac{aL}{At} \ln \frac{h_o}{h_f}$$

Trial No.	Duration, t (seconds)	Initial Head, Head, h_o (cm)	Final Head h_f (cm)	Permeability, K_T (cm/sec)
1	90000	195.9	191.1	1.24×10^{-7}
2	83400	191.1	187.8	9.42×10^{-8}
3	85800	187.8	185.1	7.61×10^{-8}
4	86700	185.1	182.2	8.21×10^{-8}
5	261600	182.2	174.0	7.94×10^{-8}
6	89100	174.0	171.4	7.62×10^{-8}
7	86400	171.4	168.8	7.98×10^{-8}
8	102600	168.8	166.0	7.35×10^{-8}
9	86400	166.0	163.4	8.24×10^{-8}
			Ave. K_T	8.53×10^{-8}

C) PROCTOR COMPACTION TESTS

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

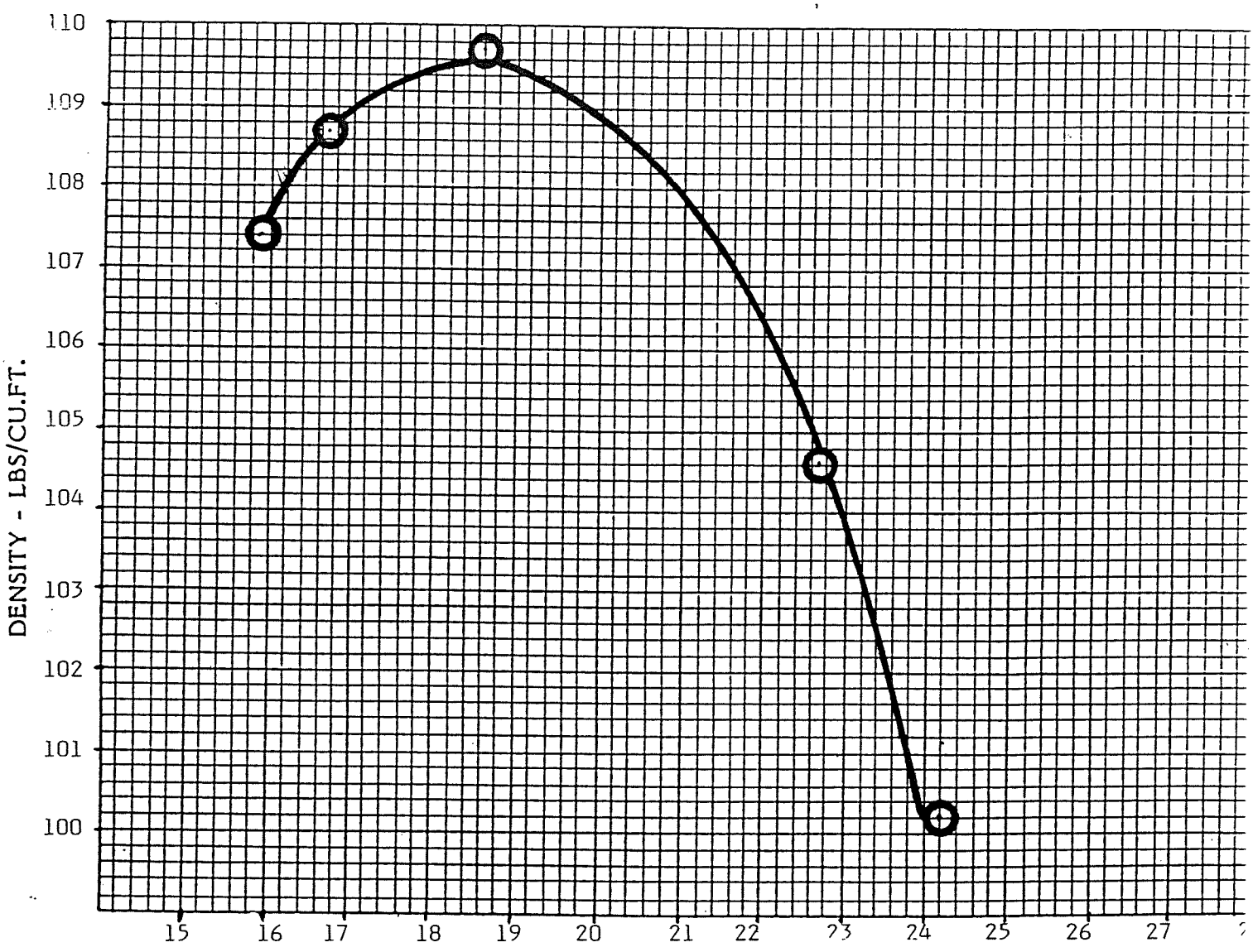
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM Vernon County Clay Search TEST NO. S-5

SAMPLE DESCRIPTION Clay SAMPLE NO. S2-12

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 109.7 LBS./CU.FT. OPTIMUM MOISTURE 18.6 %

REMARKS

TESTED BY K. Y. DATE Oct. 5 19 89

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

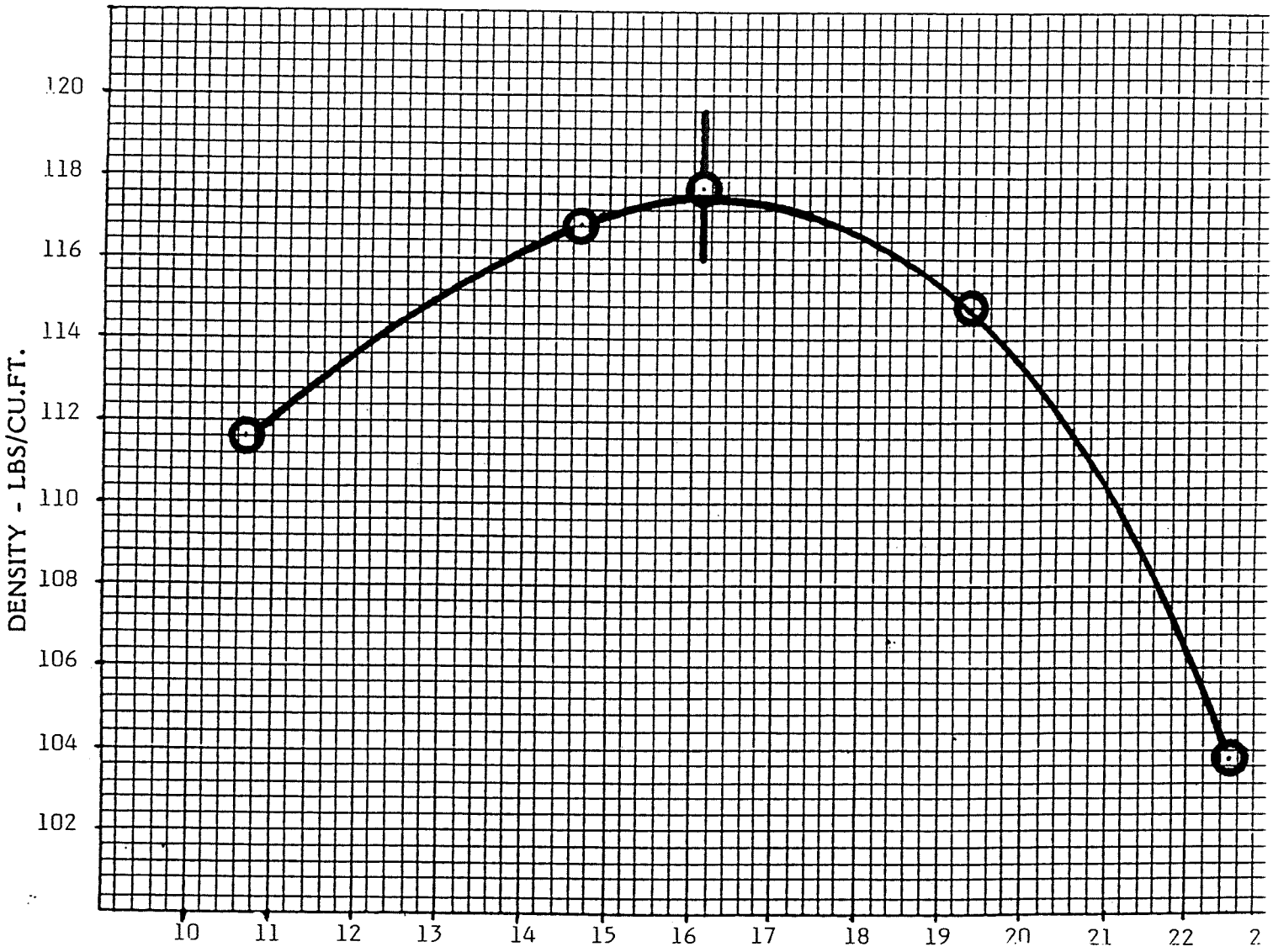
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM Vernon County Clay Search TEST NO. S-2

SAMPLE DESCRIPTION Clay SAMPLE NO. S4-8

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 117.9 LBS./CU.FT. OPTIMUM MOISTURE 16.1 %

REMARKS

TESTED BY K. Y. DATE Oct. 9 1989

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

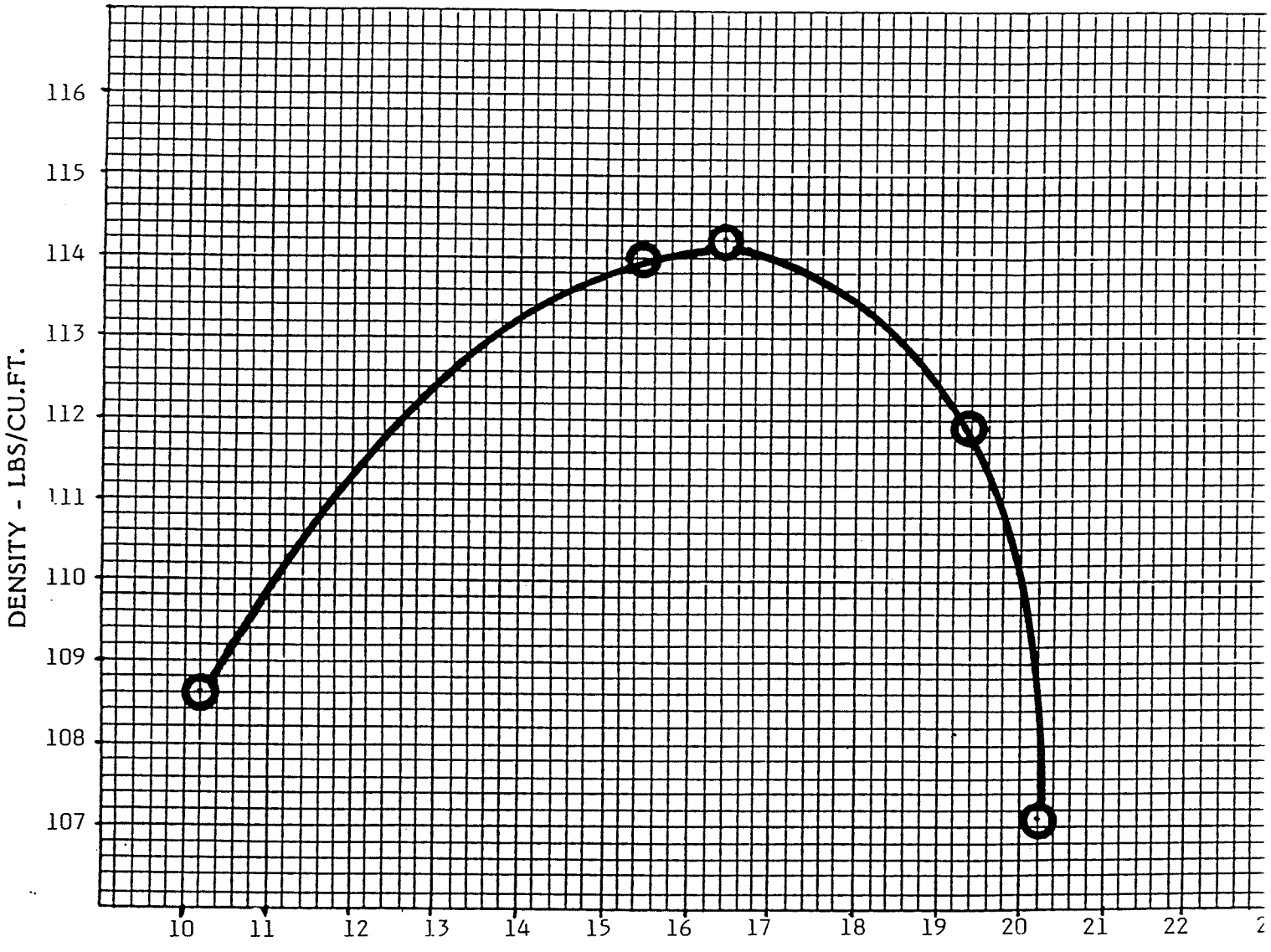
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM Vernon County Clay Search TEST NO. S-3

SAMPLE DESCRIPTION Clay SAMPLE NO. S4-13

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 114.2 LBS./CU.FT. OPTIMUM MOISTURE 16.4 %

REMARKS

TESTED BY K. Y. DATE Oct. 9 19 89

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

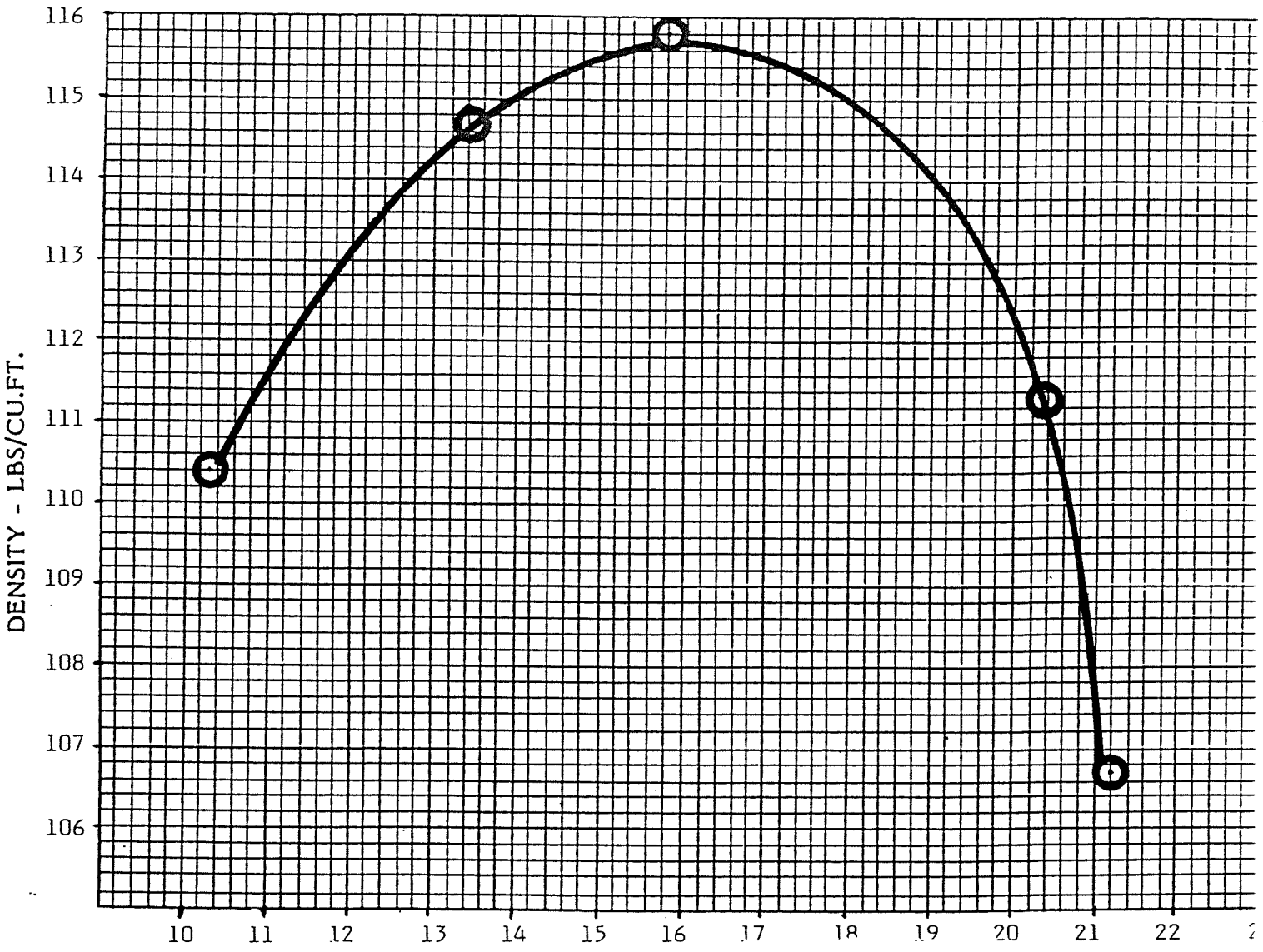
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM Vernon County Clay Search TEST NO. S-4

SAMPLE DESCRIPTION Clay SAMPLE NO. S4-15

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 115.8 LBS./CU.FT. OPTIMUM MOISTURE 15.8 %

REMARKS

TESTED BY K. Y. DATE Oct. 8 19 89

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

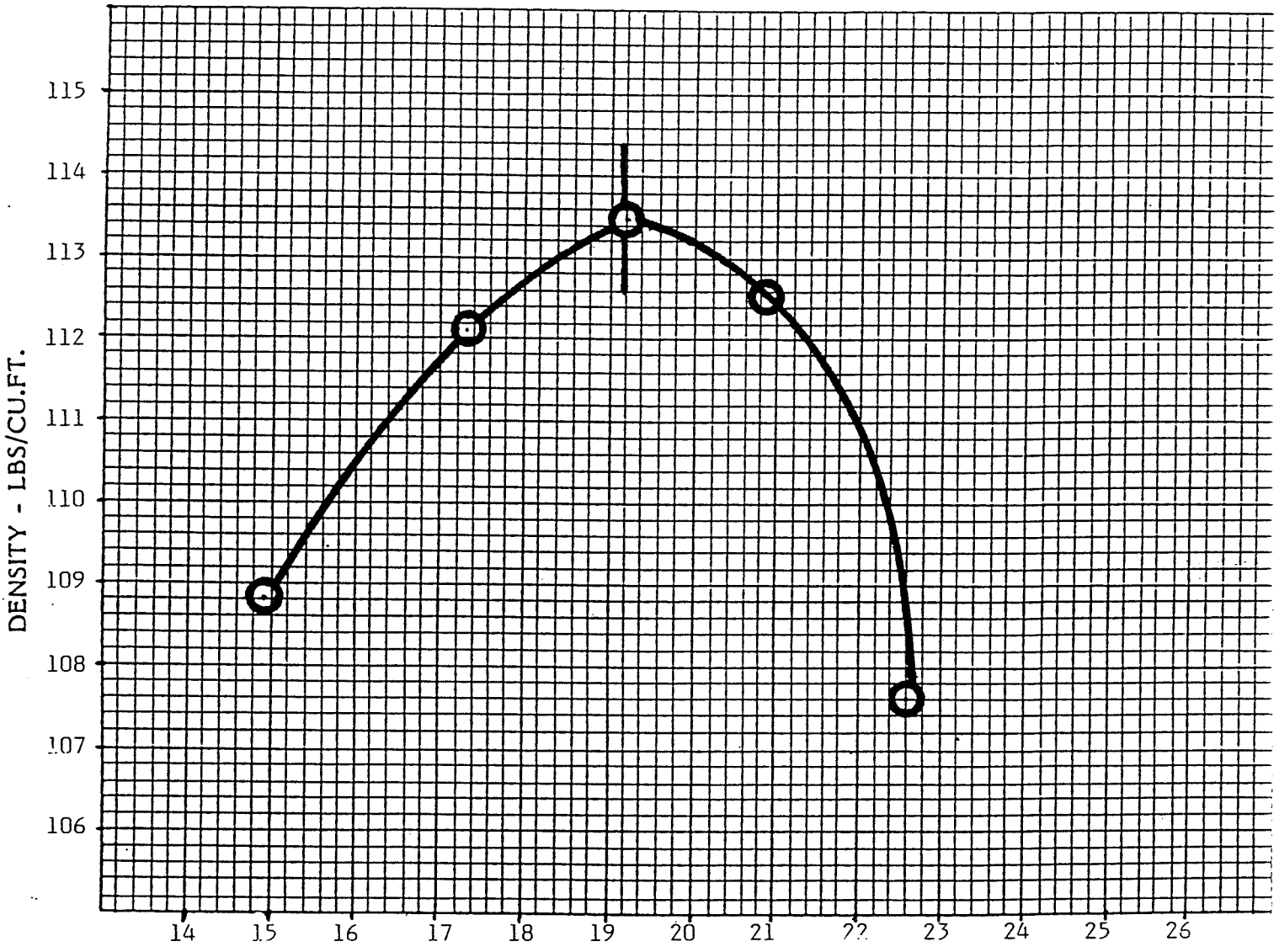
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM Vernon County Clay Search TEST NO. S-1

SAMPLE DESCRIPTION Clay SAMPLE NO. S4-23

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 113.5 LBS./CU.FT. OPTIMUM MOISTURE 19.2 %

REMARKS

TESTED BY K. Y. DATE Oct. 8 19 89

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

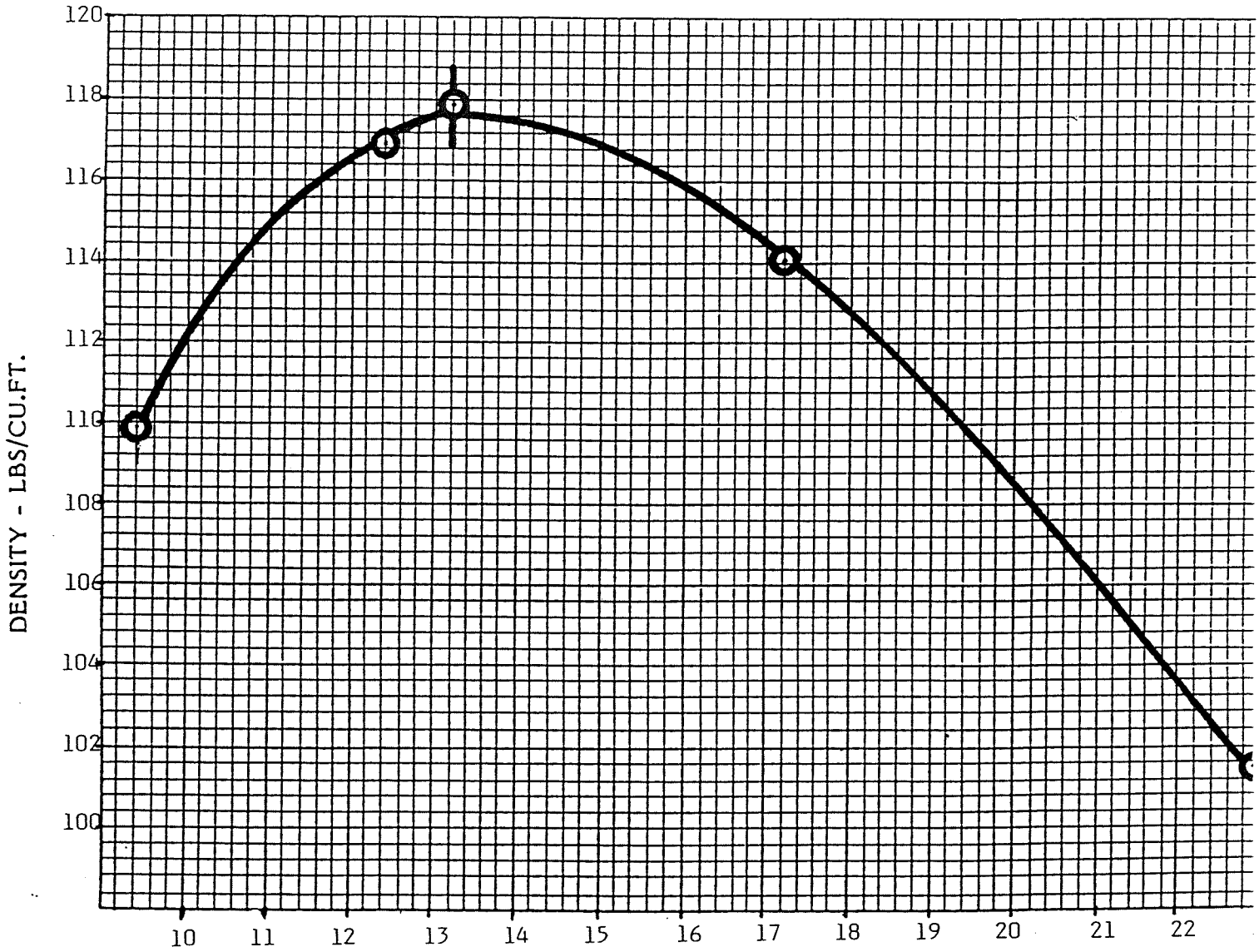
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM _____ TEST NO. 8

SAMPLE DESCRIPTION Clay SAMPLE NO. S-8

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 117.92 LBS./CU.FT. OPTIMUM MOISTURE 13.21 %

REMARKS _____

TESTED BY K.Y. DATE Jan. 9 19 90

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

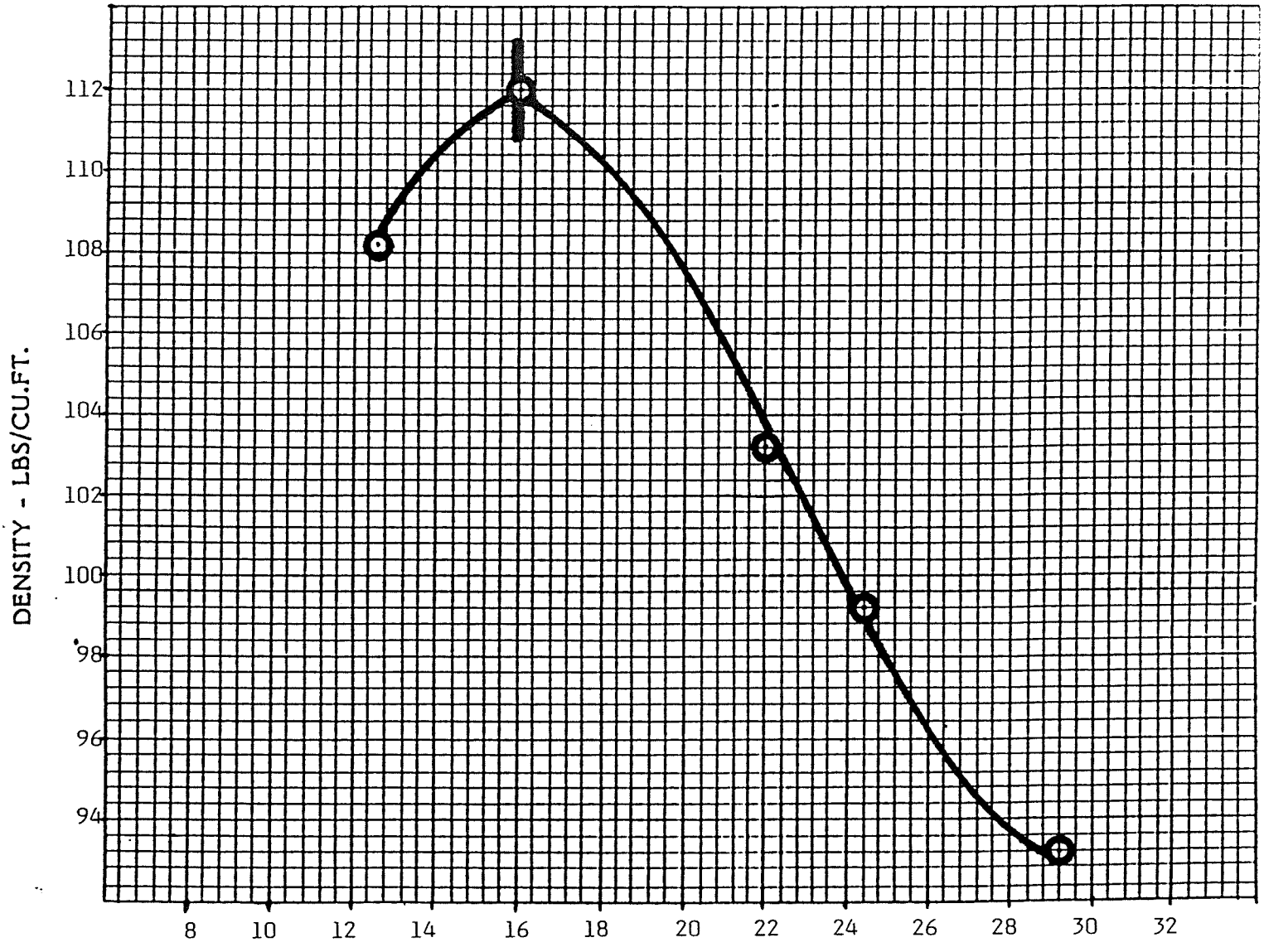
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM _____ TEST NO. 7

SAMPLE DESCRIPTION Clay SAMPLE NO. S-7

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 111.99 LBS./CU.FT. OPTIMUM MOISTURE 15.99 %

REMARKS _____

TESTED BY K.Y. DATE Jan. 4 1990

Central Wisconsin
Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

COMPACTION TEST

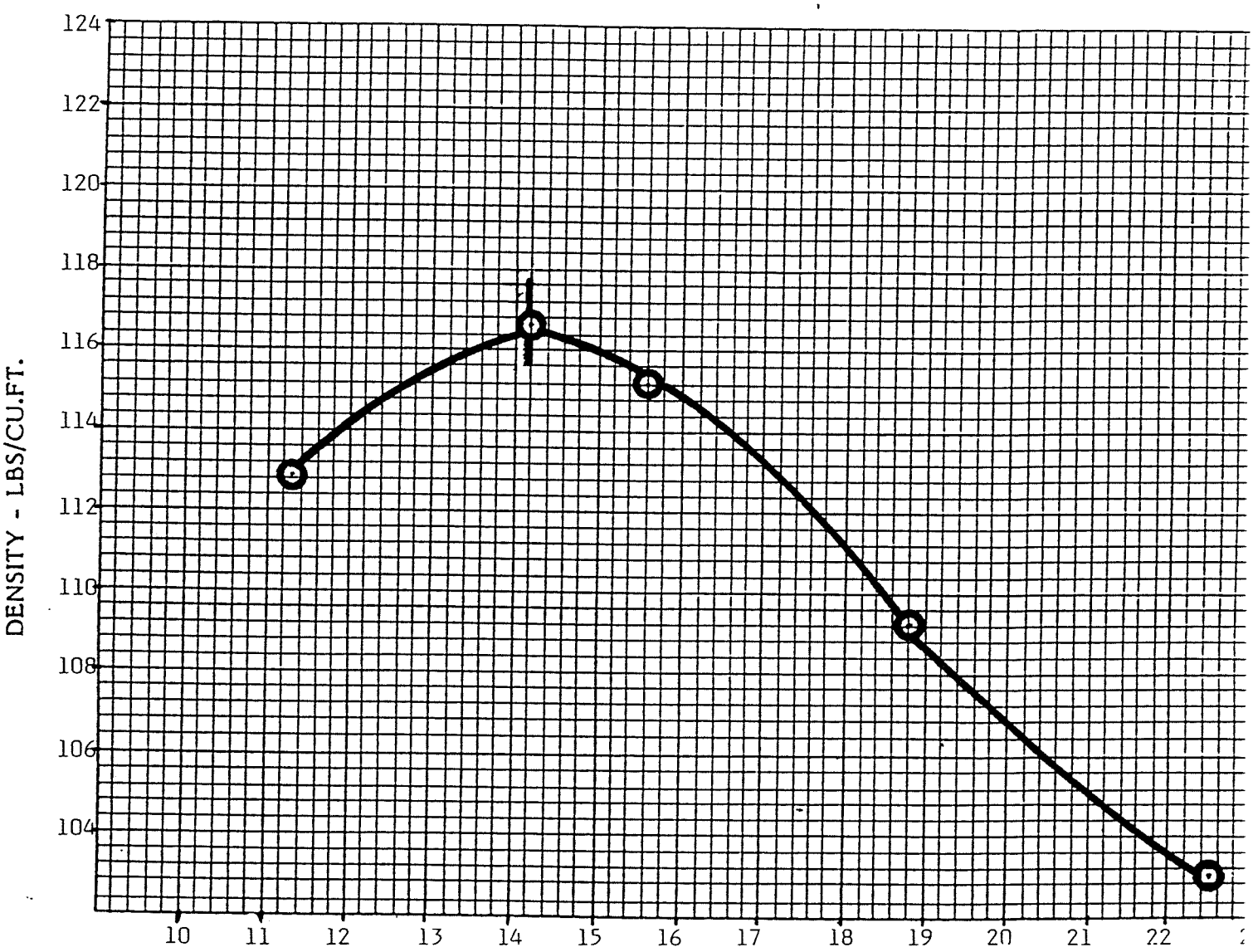
PROJECT NAME Vernon County JOB NO. 70389

SAMPLE FROM _____ TEST NO. 6

SAMPLE DESCRIPTION Clay SAMPLE NO. S-6

ASTM D1557-78 Method A MOLD SIZE 4 IN.

HAMMER WT. 10 LBS. 18 IN. 5 LAYERS 25 BLOWS/LAYER



MAIXMUM DRY DENSITY 116.64 LBS./CU.FT. OPTIMUM MOISTURE 14.20 %

REMARKS _____

TESTED BY K.Y. DATE Jan 4 19 90

T-2 – Clay Borrow Source B Information

CWE, Inc. 5707 Schofield Avenue, P.O. Box 107, Weston, WI 54476-0107 Toll Free: (800) 261-5707
Phone: (715)359-9400 Fax: (715)355-4199 Email: general@cwengineers.com Web: www.cwengineers.com

April 20, 2011

FILE COPY

Ms. Jill Schoen, Program Manager
Waste and Materials Management Program
WDNR - West Central Region Headquarters
1300 West Clairemont Avenue
P.O. Box 4001
Eau Claire, WI 54702-4001

Re: **Proposed Clay Borrow Site**
Vernon County Balefill, License No. 03268
CWEA Project No. 946-11000

Subject: **Submittal of Report for Proposed Clay Borrow Site**

Dear Ms. Schoen:

The Vernon County Balefill has an approved plan of operation to construct a vertical expansion. To insure that sufficient clay is available for balefill construction, the County desires to use an undeveloped portion of its balefill property as a clay borrow source. An investigation of this site has been completed in accordance with the requirements of s. NR 512.15, and the enclosed report summarizes the results of that investigation. On behalf of the County, CWE, Inc. asks that the Department review this report and render its opinion as to the suitability of the proposed clay borrow source.

Please feel free to contact me should you have any questions regarding this submittal or the project in general. I may be reached at (715) 359-9400 or toll-free at (800) 261-5707 or via email at hzeyghami@cwengineers.com.

Sincerely,
CWE, Inc.

Hooshang Zeyghami, M.S., P.E., BCEE
Chief Engineer

Enclosure – *Plan Modification Identification and Characterization of a Proposed Clay Borrow Site for the Vernon County Sanitary Balefill*
One Set of Plan Sheets 11" X 17"

cc: Mr. Gene Edwards, Solid Waste Manager, Vernon County Landfill, Box 247-B, Route 3, Viroqua, WI 54665
Mr. Martin Herrick, WDNR, LaCrosse

PLAN MODIFICATION

IDENTIFICATION AND CHARACTERIZATION

OF A PROPOSED CLAY BORROW SITE

for the

VERNON COUNTY SANITARY BALEFILL
License # 03268

CWE PROJECT # 946-11000

April 2011

COPY

CWE, Inc.

general@cwengineers.com
www.cwengineers.com

5707 Schofield Avenue
Weston, WI 54476-0107
Phone: (715) 359-9400
Fax: (715) 355-4199

106 North Main Street
Viroqua, WI 54665
Phone: (608) 637-2932
Fax: (608) 637-3602

PLAN MODIFICATION

IDENTIFICATION AND CHARACTERIZATION

OF A PROPOSED CLAY BORROW SITE

for the

VERNON COUNTY SANITARY BALEFILL
License # 03268

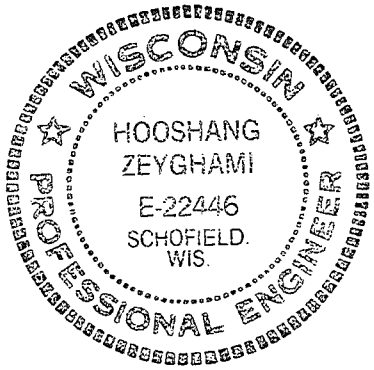
CWE PROJECT # 946-11000

April 2011

Prepared By:

Central Wisconsin Engineers, Inc.
5707 Schofield Avenue
Weston, WI 54476
Phone (715) 359-9400
Fax (715) 355-4199

I, Hooshang Zeyghami, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 500 to 538, Wis. Adm. Code.



Hooshang Zeyghami, M.S., P.E., BCEE
Chief Engineer

I, David L. Ozsvath, hereby certify that I am a registered professional geologist in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 10, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 500 to 538, Wis. Adm. Code.

David L. Ozsvath, Ph.D., P.G.

TABLE OF CONTENTS

FIGURES (located in Appendix A)

LIST OF PLAN SHEETS (included separately)

LIST OF APPENDICES

1.0 GENERAL SITE INFORMATION

1.1 Purpose

The purpose of this report is to present the results of a field investigation that was undertaken to characterize a clay source for use in constructing the Vernon County Balefill Vertical Expansion. The format of the report follows NR 512.15, Wis. Adm. Code, which describes the requirements for the identification and characterization of borrow sources as part of a landfill feasibility study.

1.2 Project History

Vernon County opened a sanitary balefill in 1993 and then a construction and demolition (C&D) waste landfill in 1995 to serve the solid waste disposal needs of its residents. The C&D waste landfill reached capacity in September of 2005, since which time C&D waste has been placed in the sanitary balefill. Vernon County received a favorable feasibility determination for the construction of a vertical expansion to its existing balefill in June 2004, and conditional approval for the plan of operation was received in August 2005.

Although construction of the vertical expansion should increase the need for acceptable clay by less than two percent of what had been projected for the original balefill design, the existing clay borrow source (also located on the balefill property) appears to contain less clay than had been estimated when the balefill was approved. Therefore, to insure that an adequate volume of clay is available, a clay search expanded into an adjacent area of the property.

1.3 Owner and Operator

This facility is owned by Vernon County and operated by the Vernon County Solid Waste Department.

Contact: Mr. Gene Edwards, Solid Waste Manager
S3705 County Road LF
Viroqua, WI 54665
Phone: (608) 634-2900
Email: gedwards@vernoncounty.org

1.4 Engineering Consultant

Central Wisconsin Engineers, Inc.
5707 Schofield Avenue
Weston, WI 54476

Contact: Mr. Hooshang Zeyghami, M.S., P.E., BCEE
Phone: (715) 359-9400
E-mail: hzeyghami@cwengineers.com

2.0 LOCATIONAL INFORMATION

2.1 Site Location

The proposed clay borrow source is located on the same property as the Vernon County Sanitary Balefill (see Figure 1 Land Atlas/Plat Map in Appendix A for the locations of the balefill and the proposed borrow site). The portion of the property under consideration is situated to the southwest of the existing balefill along the balefill entrance road from CTH LF and encompasses roughly 11 acres (see Plan Sheets 1 and 2 of 10 for site location maps). The legal description for this proposed borrow site is as follows:

> The E ½ of the NW ¼ of the NW ¼ all in Section 22 of Township 13 North, Range 4 West, in the Town of Viroqua, Vernon County, Wisconsin.

2.2 Initial Site Inspection

In a letter dated September 3, 2009 to Mr. Martin Herrick, WDNR Project Engineer, CWE, Inc., on behalf of Vernon County, requested that the Department conduct an initial site inspection of the proposed clay borrow site. Mr. Herrick, accompanied by Mr. Gene Edwards, Solid Waste Manager, performed an inspection of the proposed borrow site on October 15, 2009.

Mr. Herrick rendered the site suitable and compliant with the locational requirements of ch. NR 504.04 Wis. Adm. Code in a letter to Mr. Gene Edwards, dated May 28, 2010. Copies of these letters and other regulatory correspondence pertaining to the proposed clay borrow site, are included in Appendix B.

2.3 Present Land Use

The proposed clay borrow site occurs within a 253-acre, irregularly shaped parcel that is owned by Vernon County and used for solid waste disposal. Land use within one mile of this property is primarily agricultural, either as crop land or pasture (see Figures 2 and 3 in Appendix A for aerial maps obtained from the Wisconsin Department of Natural Resources website.) However, sloping land to the northeast is wooded and used for timber and private hunting. The Vernon County Solid Waste Management Plan (2002) indicates that there are no scientific or natural areas, State parks, or County forest lands within several miles of the property under consideration.

2.4 Transportation Routes

Because the proposed borrow source is located on the same property as the balefill, the hauling of clay to the balefill would not require the use of public roads as transportation routes (see Plan Sheet 2).

2.5 Access Restrictions

Because the borrow source would be located on the same property as the balefill, there are no access restrictions to obtaining the clay.

2.6 Hydrologic Features

The proposed clay borrow source is situated near the top of a ridge that separates Seas Branch from an intermittent tributary to that permanent stream. Consequently, there are no permanent surface water features at the site. The natural topography directs runoff to the east towards the intermittent tributary to Seas Branch. Ultimately, runoff from the site enters Seas Branch, which is impounded by an earthen dam located roughly one mile northeast of the site (see Figure 4 in Appendix A for the WDNR Map of the Seas Branch Earthen Dam location, and Figure 5 for a USGS topographic map of this area).

Seas Branch valley also contains areas of wetlands and wetland indicator soils, some of which occur within one-half mile of the proposed site (see Figure 3 in Appendix A for the WDNR Wetland Indicator Map). The excavation of clay at the project site is not expected to have any effect on these wetlands.

Based on water level measurements from monitoring wells near the sanitary balefill, it appears that the water table occurs roughly 100 to 130 feet below the lowest elevation at the proposed borrow site in the southeast corner. Groundwater flows generally to the north-northeast within the Prairie du Chien dolomite and underlying sandstones.

Monitoring wells near the balefill also encountered a shallower "perched" water table that occurs where vertical groundwater movement is inhibited by lowly permeable shale beds within the Prairie du Chien bedrock. Springs and seeps are produced where these shale beds intersect the land surface, such as along the hillsides of Seas Branch valley. If the perched water table extends beneath the proposed clay borrow site, it occurs less than 100 feet below the land surface.

2.7 Natural or Historical Areas

On July 15, 2005, the WDNR Archaeologist provided cultural resource clearance for the proposed clay borrow site. The letter indicated that the borrow site would not impact any known archaeological sites or historic structures in the project area (see Appendix B).

On May 1, 2002, an approved Endangered Resources Review letter (Log #02-051) was issued by the WDNR Bureau of Endangered Resources for the vertical expansion of the existing sanitary solid waste landfill (see Appendix B for correspondence).

In accordance with recent correspondence with the Bureau of Endangered Resources, CWE prepared and submitted a current review request form (Form 1700-047 Revised 2/11) for the proposed clay borrow site. The response from the Bureau of Endangered Resources is pending (see Appendix B for copies of the regulatory correspondence and the endangered resources review request form with associated attachments).

3.0 FIELD AND LAB INVESTIGATIONS

3.1 Test Pits

A qualified representative of CWE inspected the excavation of 15 test pits within the proposed clay borrow source area on December 3, 2004 (see Plan Sheet 3 of 10 for test pit locations). This area encompasses approximately 18 acres, which requires a minimum of 15 test pits to satisfy the requirements of s. NR 512.15(2)(a).

The depth of the test pit excavations varied between 2.5 and 9.5 feet, with most pits extending to 8 or 9 feet below land surface (see Appendix C for test pit logs). Each major soil unit encountered in these pits was described based on field observations and results of analyzing selected samples in the laboratory.

3.2 Soil Samples

In accordance with s. NR 512.15(2)(b), two representative samples from each pit were analyzed for grain size distributions and Atterberg limits (a total of 31 samples). Three soil samples (each from a different pit) were also submitted for five-point modified Proctor tests and for falling-head permeability tests. A summary of the results from all of the laboratory analyses conducted on test pit soil samples is contained in Appendix D.

3.3 Results of Investigation

The geologic materials encountered in the 15 test pits are the same as what was found in other onsite locations during the feasibility studies for the balefill and its vertical expansion. The upper 10 feet of subsurface material exposed in the test pits, includes loess (wind blown deposits of silt and clay) and residuum (ranging from silty clay to clayey sand) that is derived from weathering of the underlying bedrock. Although these fine-grained materials have different geologic origins, each includes clay-rich horizons which meet the requirements for landfill liners as defined in the Wisconsin Administrative Code.

Appendix D contains a table that summarizes the results of all laboratory analyses conducted on soil samples. This table shows that all but one sample (S-3 fromTP-3) had more than 50 percent of its grain sizes by weight pass through the 200 sieve (the average P-200 for all samples is 91). Thus, 30 of the samples meet the requirement for clay used in landfill liners that is specified in s. NR 504.06(2)(a)1. The sample that did not meet this standard was collected from the bottom of TP-3, beneath a layer of acceptable clay material.

The results of the Atterberg limits tests showed that all 30 samples with greater than 50 percent passing the 200 sieve also had liquid limits of greater than 25 percent (the average value is 42.0 percent), and none of the liquid limits are less than 20 percent. This satisfies the requirement of s. NR 504.06(2)(a)3. for clay used in landfill liners.

The 30 samples that meet the requirements for clay in both s. NR 504.06(2)(a)1. and 3. have an average plasticity index of 19.2 percent, which meets the requirement of greater than 12 percent specified in s. NR 504.06 (2) (a) 4. However, seven of these samples

have a plasticity index of less than 10 percent and thus do not meet the standard for clay used in landfill liners. Three of these seven samples (S-2 from TP-4, S-2 from TP-5, and S-2 from TP-9) were collected at the bottom of a test pit, beneath the layer of acceptable clay material. Two of the samples came from a single pit (TP-14), suggesting that none of the material at this location is acceptable for use as clay in a liner. The remaining two samples (S-1 from TP-8 and S-1 from TP-15) are shallow samples collected from above acceptable clay material.

Three samples were submitted for Proctor tests (ASTM D1557-78, Method A). The tests showed maximum dry densities between 104 and 113 lbs/ft^3 (an average of 109 lbs/ft^3) and optimum moisture contents between 14 and 19 percent (average of 16.5 percent). Falling-head permeability tests conducted on these samples yielded saturated hydraulic conductivity values between 1.08×10^{-8} and 9.12×10^{-8} cm/sec. All of these results exceed the minimum requirements for clay liner material as specified in s. NR 504.06 (2) (a) 2. Copies of the laboratory reports for the water content, grain size analysis, Proctor tests, permeability, and Atterberg limits are included in Appendices E through I, respectively.

3.4 Clay Isopach Map

Plan Sheet 4 of 10 is an isopach map of clay that meets all of the requirements for landfill liner material as specified in s. NR 504.06(2). To create this map, the thickness of acceptable clay material at each test pit was estimated based on its log and the results of laboratory analyses. In all cases, the uppermost foot of soil is assumed to be topsoil that does not meet the minimum requirements for clay used in landfill liners. There are various ways to interpolate the clay thicknesses between test pits; and the isopach map on Plan Sheet 4 is one of the simpler interpretations. Plan Sheets 9 and 10 show the variations in clay thickness along four cross sections drawn through the site.

3.5 Volume Calculations

Based on the isopach map shown in Plan Sheet 4, it appears that at least 69,750 cubic yards of acceptable clay is available from this borrow source. This estimate is based on the mapped variation in clay thickness (which ranges from 0 to 7 feet thick) and the area from which clay will be extracted (roughly 10.6 acres). However, the actual volume of clay that is extracted will depend on the conditions encountered during excavation. Clay will only be taken from areas where its thickness is greater than two feet, and the precise areal extent of clay meeting that requirement will not be known until excavation begins.

Future activities at the sanitary balefill that will require clay material include construction of the remaining liner, placement of intermediate cover, and placement of the final cover system during closure, as described in the approved Plan of Operation for this facility. To complete this work, an estimated 55,000 cubic yards of clay meeting the requirements of ch. NR 504 will be needed. The volume of clay available from the proposed borrow site exceeds this projected need by nearly 15,000 cubic yards and should therefore be more than sufficient for all future construction activities.

4.0 SITE DEVELOPMENT, OPERATION, AND CLOSURE

4.1 Clay Separation Methods

Because the thickness of clay at the proposed borrow site ranges from less than two to greater than five feet thick, a methodology for separating acceptable from unacceptable soil material is required by s. NR 504.075(11). Whenever soil is excavated at the site, a qualified technician from CWE will be present to supervise the process. The decision to accept or reject excavated soil will be made based on his/her visual inspection; however, soil samples will also be collected periodically for laboratory analyses to provide quality control on the technician's judgment. This procedure has already been used to separate acceptable from unacceptable soil material at another borrow site on the Vernon County Sanitary Balefill property when clay was excavated to construct the existing balefill liner.

4.2 Clay Extraction and Hauling

The extraction of clay from the proposed borrow site will be completed in approximately four different phases, each of which will coinicide with the future construction needs at the balefill. In an effort to keeps costs in check, the clay will be excavated and transported directly as needed during construction activities. Clay from the borrow site is not expected to be stockpiled.

4.3 Drainage and Sediment Control

Sediment erosion prevention and surface water drainage control will be implemented as appropriate in accordance with best managed practices. To control storm water runoff and prevent sediment from reaching surface water bodies, a storm water management plan will be implemented to meet the applicable requirements of NR 504.09. This will be accomplished through a combination of phased excavation and the use of sedimentation basins and drainage swales to prevent sediments from leaving the site.

Clay excavation will commence in the topographically high northwest corner of the site (see Plan Sheet 5) and proceed towards the southwest. This will insure that excavation receives only the water from direct precipitation and not the runoff from adjacent areas. With the excavation being conducted in multiple phases, the limited duration and extent of the clay removal will limit opportunities for significant runoff to occur. However, other measures, such as silt fences, and tracking pads will be used as needed. The final site topography will generally slope to the southwest with localized depressions between the phases of excavation to trap runoff. Erosion control practices are shown on Sheets 5 and 6. The geologic cross sections are depicted in Plan Sheets 8-10.

Best management practices will be implemented throughout the duration of clay mining operations. In general, these practices will include:

- Installing silt fence on the down-slope side of the mining area
- Installing a permanent sedimentation basin at the down-slope base of the mine area
- Installing a vehicle tracking pad at the entrance/exit of the mined area
- Inspecting the mined area at least once a week and after every significant rainfall to assess the status of the erosion and sedimentation control practices.

4.4 Reclamation Plan

A Vernon County Nonmetallic Mine Reclamation Application Permit will be completed and submitted for approval if it is deemed necessary. All applicable local, state, county, and federal permits will also be obtained prior to the initiation of clay mining. Plan Sheet 6 shows the proposed final grades for the borrow source area after the required clay has been excavated.

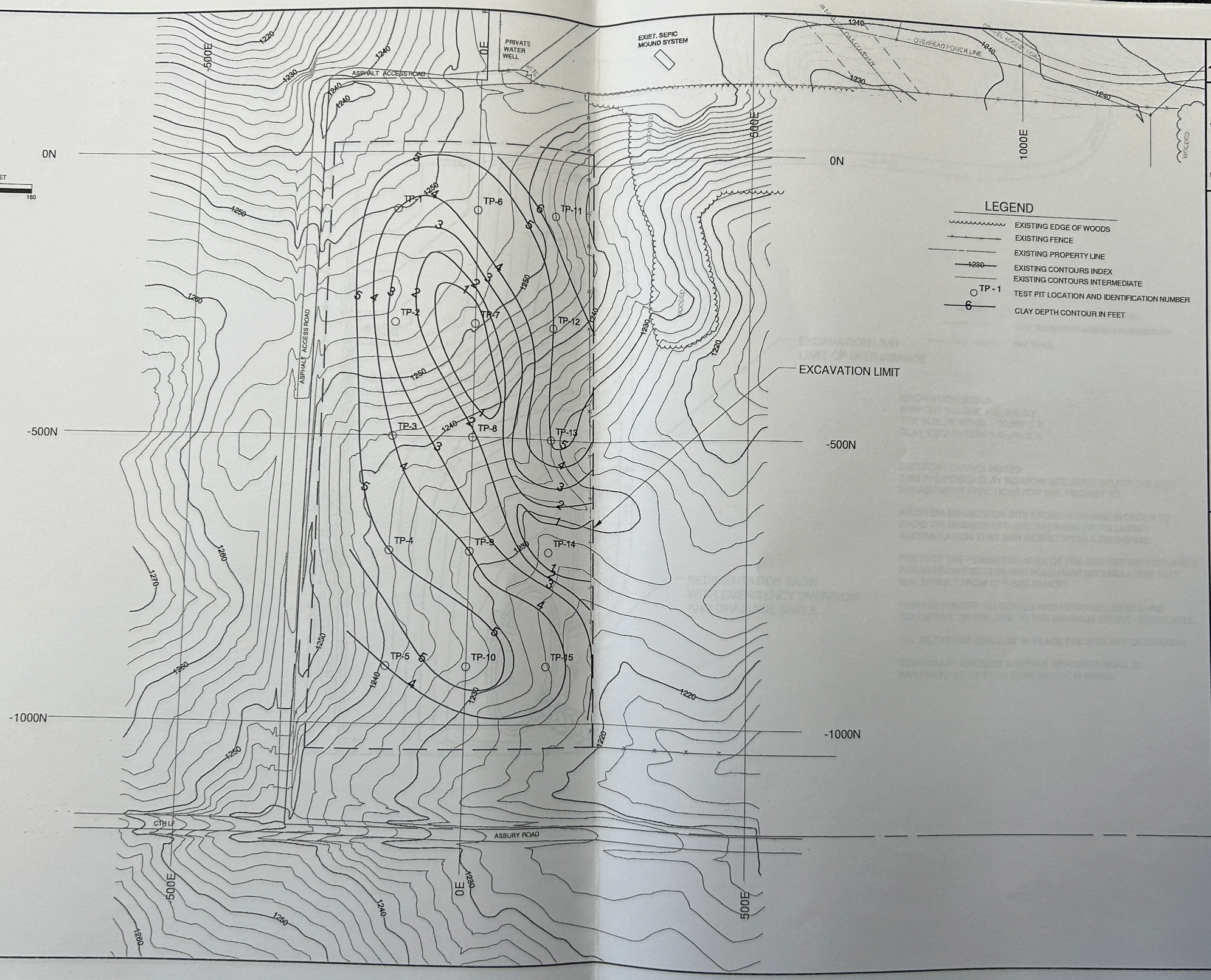
Each phase of construction will be reclaimed to final grades and cover at the end of each excavation. Reclamation activities will include:

- Grading the limits of the mine area to slopes typically around 4:1 (horizontal to vertical measures), but not steeper than 3:1
- Grading the base of the mined area to slopes that vary from 1% to 6%.
- Restoring the topsoil previously removed in an even thickness across the entire mined area
- Seeding, mulching, and fertilizing to vegetate the mined area with native forbs and grasses
- Cleaning and maintaining the sedimentation basin at the end of each construction phase to assure continued functionality
- Maintaining the silt fence at least until the disturbed area is revegetated
- Removing the tracking pad when the final reclamation activities are complete.

To minimize erosion, all existing vegetation will be left intact wherever feasible. After the final grades are achieved at the end of a construction season, the topsoil will be seeded for permanent erosion control. Seeding efforts may include both mulch and/or fertilizer, where appropriate. Erosion mats will be used to hold seed and mulch on steep surfaces and to reduce wind removal of loose mulch. New slopes will be monitored the following spring to insure that an adequate vegetative cover has developed.

5.0 CONCLUSION

CWE has conducted an investigation of soil material at the proposed borrow site. Based on our evaluation of the laboratory test results generated by this investigation, it appears that there are roughly 70,000 cubic yards of material at the site which meet the minimum requirements for clay used in a landfill liner. Because the proposed borrow site is located on the same property as the solid waste disposal facility where the clay will be used (the Vernon County Sanitary Balefill), disturbances caused by excavation and hauling will be minimized. The post-excavation reclamation plan proposes that the borrow site become a high quality wet meadow and upland meadow natural area. In light of these facts and findings, CWE recommends that the proposed site be approved as an acceptable source of clay for use in the construction of a sanitary landfill.



CWE, Inc.
5707 SCHOFIELD AVE.
WESTON, WISCONSIN
54476
PHONE: (715) 359-9400
FAX: (715) 355-4199
general@cwengineers.com
www.cwengineers.com

PROJECT:

CLAY ISOPACH MAP
VERNON COUNTY SANITARY BALEFILL
CLAY BORROW SITE
PLAN MODIFICATION

REVISIONS:

PROJECT NO: 94602000
DRAWN BY: D.H.
CHECKED BY: S.T.
APPROVED BY: H.Z.
DATE: 04/11

SHEET: 4 OF 10

APPENDIX A

FIGURES

- Figure 1 — Site Location Map - Land Atlas/Plat Map
- Figure 2 — WDNR Aerial Project Location Map
- Figure 3 — WDNR Aerial and Wetland Indicator Map
- Figure 4 — WDNR Map of Seas Branch Earthen Dam
- Figure 5 — USGS Topographic Map

CWE, Inc.
5707 SCHOFIELD AVE.
WESTON, WISCONSIN
54476
PHONE:(715)359-9400
FAX:(715)355-4199
general@cwengineers.com
www.cwengineers.com

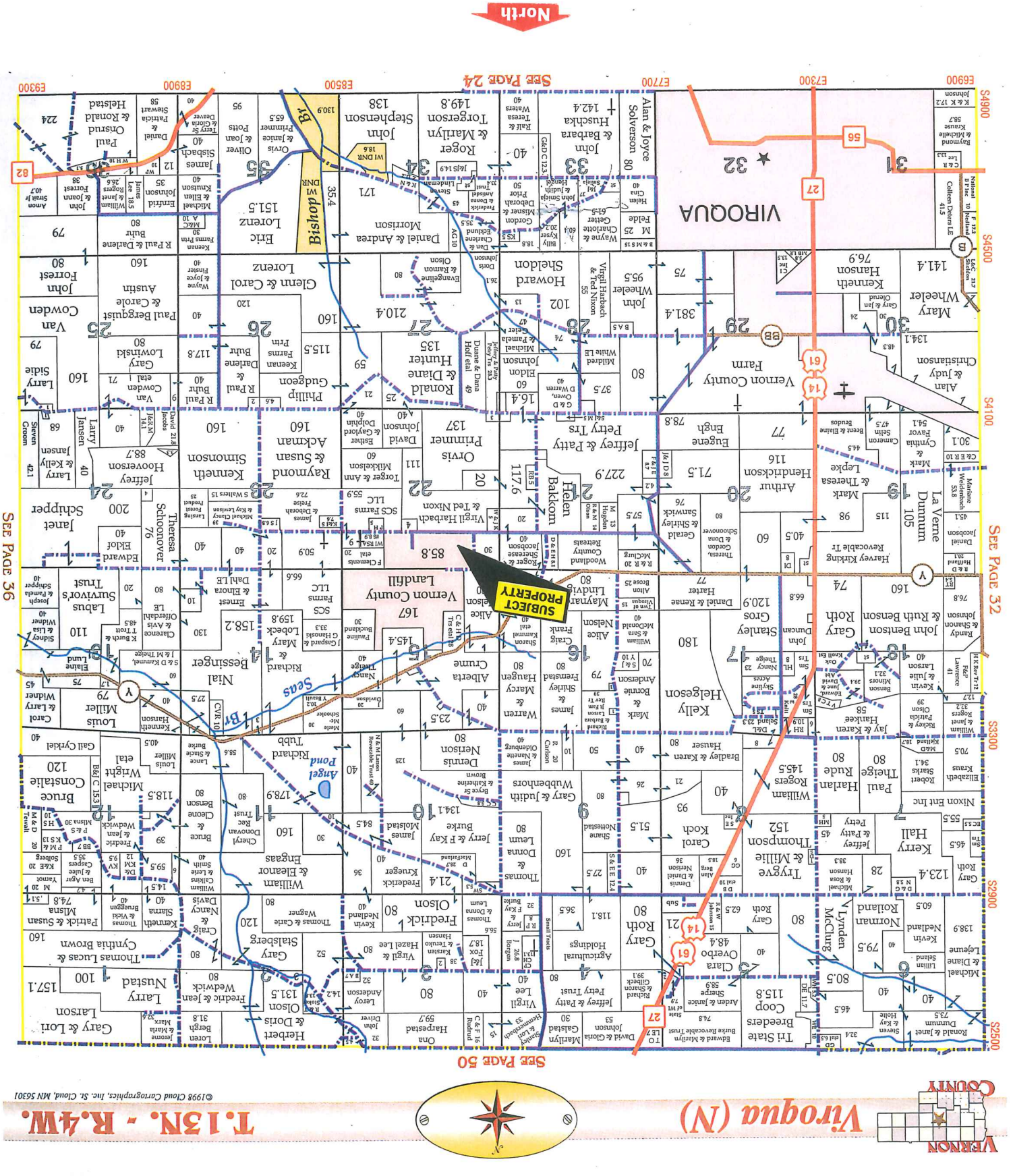
PROJECT:

SITE LOCATION MAP
PROPOSED CLAY BORROW SITE
VERNON COUNTY, WI

CWE Project No.:
9461000

SOURCE: VERNON COUNTY LAND ATLAS/PLAT BOOK

FIGURE 1



Map Created on Apr 04, 2011

Legend

Major Highways
- Interstate
- State Highway
- U.S. Highways

County Roads

Local Roads

24K County Boundaries

Civil Towns
- Civil Town

USDA Wetspots

DNR Wetland Points
- Excavated Pond
- Dammed Pond
- Wetland Too Small to Delineate
- Filled Excavated Pond
- Filled Dammed Pond
- Filled Wetland Too Small to Delineate
- Filled or Drained Wetland

DNR Wetland Areas
- Upland
- Wetland
- Filled or Drained Wetland

Wetland Indicator Soils

24K Open Water

24K Rivers and Shorelines
- Intermittent
- Fluctuating
- Perennial

0 — 750 — 1500 — 2250 ft.

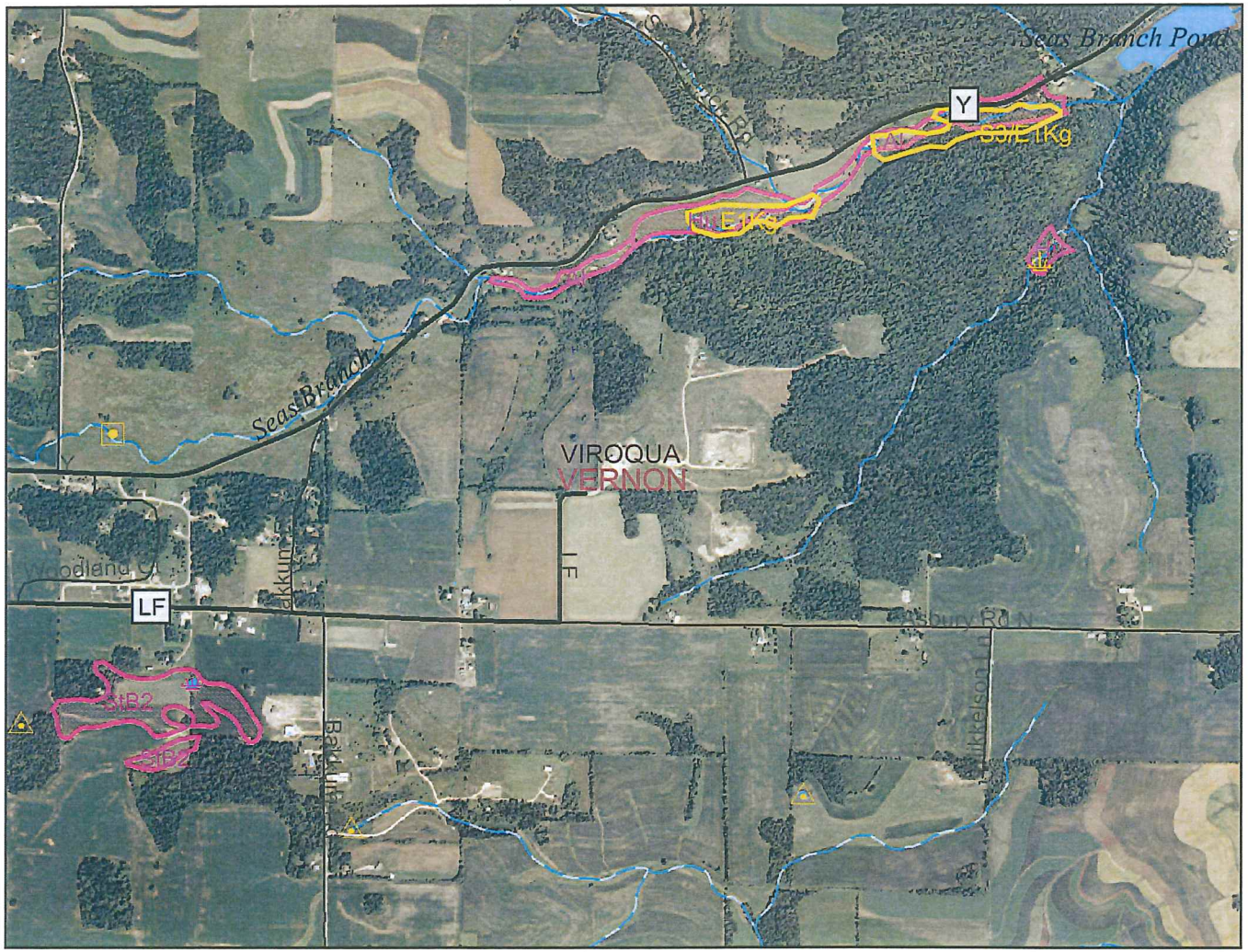
Map created on Apr 4, 2011

Scale: 1:7,496

Wisconsin Wetland Inventory (WWI) maps show graphic representations of the type, size and location of wetlands in Wisconsin. These maps have been prepared from the analysis of high altitude imagery in conjunction with soil surveys, topographic maps, previous wetland inventories and field work. State statutes define a wetland as "an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions." The principal focus of the WWI is to produce wetland maps that are graphic representations of the type, size and location of wetlands in Wisconsin. Within this context, the objective of the WWI is to produce reconnaissance level information on the location, type, size of these habitats such that they are accurate at the nominal scale of the 1:24,000 (1 inch = 2000 feet) base map. The DNR recognizes the limitations of using remotely sensed information as the primary data source. They are to be used as a guide for planning purposes. There is no attempt, in either the design or products of this inventory, to define the limits of jurisdiction of any Federal, State, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State, or local agencies concerning specified agency regulatory programs and jurisdictions that may affect such activities. The most accurate method of determining the legal extent of a wetland for federal or state regulations is a field delineation of the wetland boundary by a professional trained in wetland delineation techniques.

Figure 2 – Clay Borrow Site - WDNR Aerial Project Location Map

Map Created on Apr 04, 2011



Legend

Major Highways
- Interstate
- State Highway
- U.S. Highways

County Roads

Local Roads

24K County Boundaries

Civil Towns
- Civil Town

USDA Wetspots

DNR Wetland Points
- Excavated Pond
- Dammed Pond
- Wetland Too Small to Delineate
- Filled Excavated Pond
- Filled Dammed Pond
- Filled Wetland Too Small to Delineate
- Filled or Drained Wetland

DNR Wetland Areas
- Upland
- Wetland
- Filled or Drained Wetland

Wetland Indicator Soils

24K Open Water

24K Rivers and Shorelines
- Intermittent
- Fluctuating
- Perennial

0 2000 4000 6000 ft.

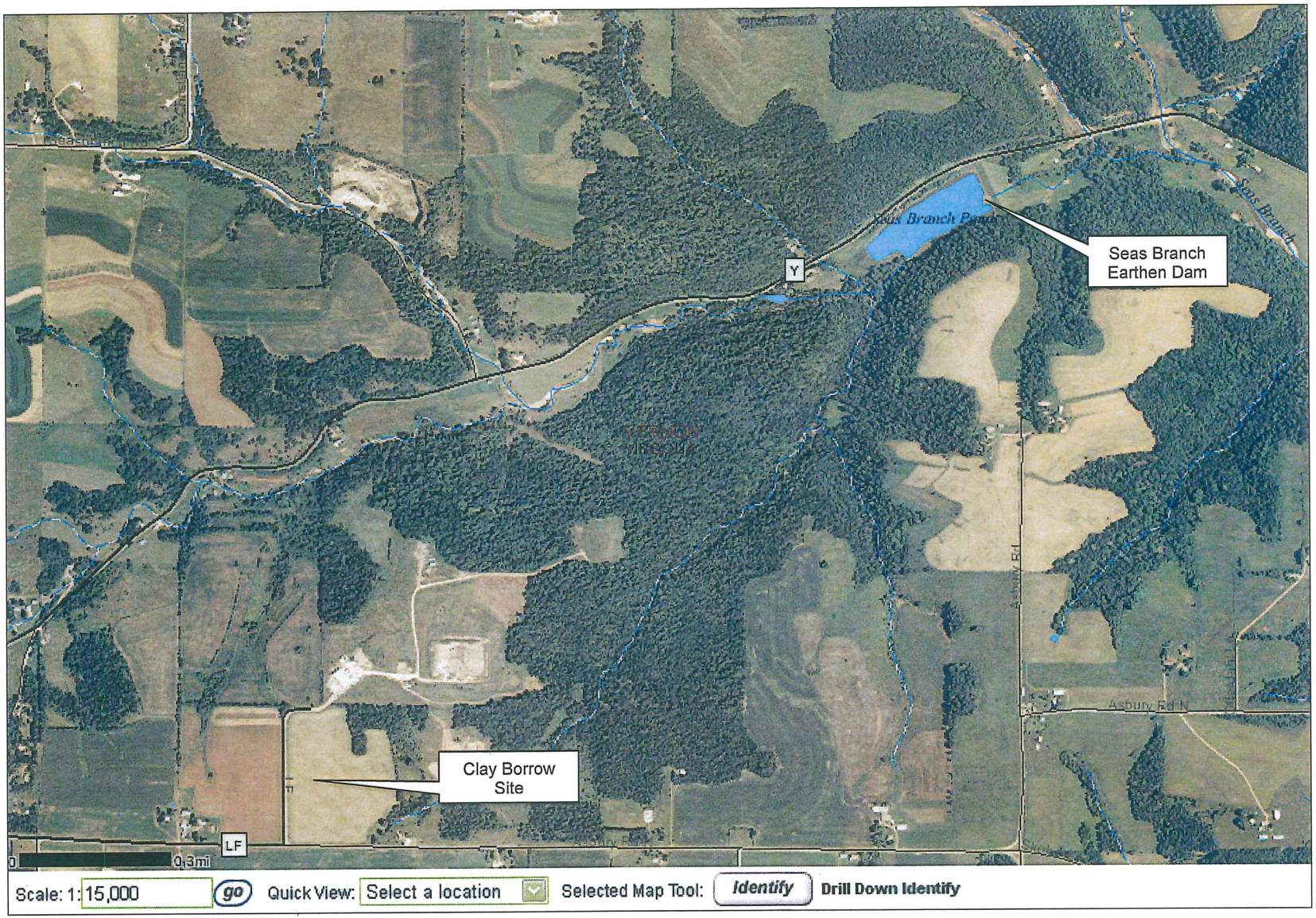
Scale: 1:19,959

Map created on Apr 4, 2011

Wisconsin Wetland Inventory (WWI) maps show graphic representations of the type, size and location of wetlands in Wisconsin. These maps have been prepared from the analysis of high altitude imagery in conjunction with soil surveys, topographic maps, previous wetland inventories and field work. State statutes define a wetland as "an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions." The principal focus of the WWI is to produce wetland maps that are graphic representations of the type, size and location of wetlands in Wisconsin. Within this context, the objective of the WWI is to produce reconnaissance level information on the location, type, size of these habitats such that they are accurate at the nominal scale of the 1:24,000 (1 inch = 2000 feet) base map. The DNR recognizes the limitations of using remotely sensed information as the primary data source. They are to be used as a guide for planning purposes. There is no attempt, in either the design or products of this inventory, to define the limits of jurisdiction of any Federal, State, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State, or local agencies concerning specified agency regulatory programs and jurisdictions that may affect such activities. The most accurate method of determining the legal extent of a wetland for federal or state regulations is a field delineation of the wetland boundary by a professional trained in wetland delineation techniques.

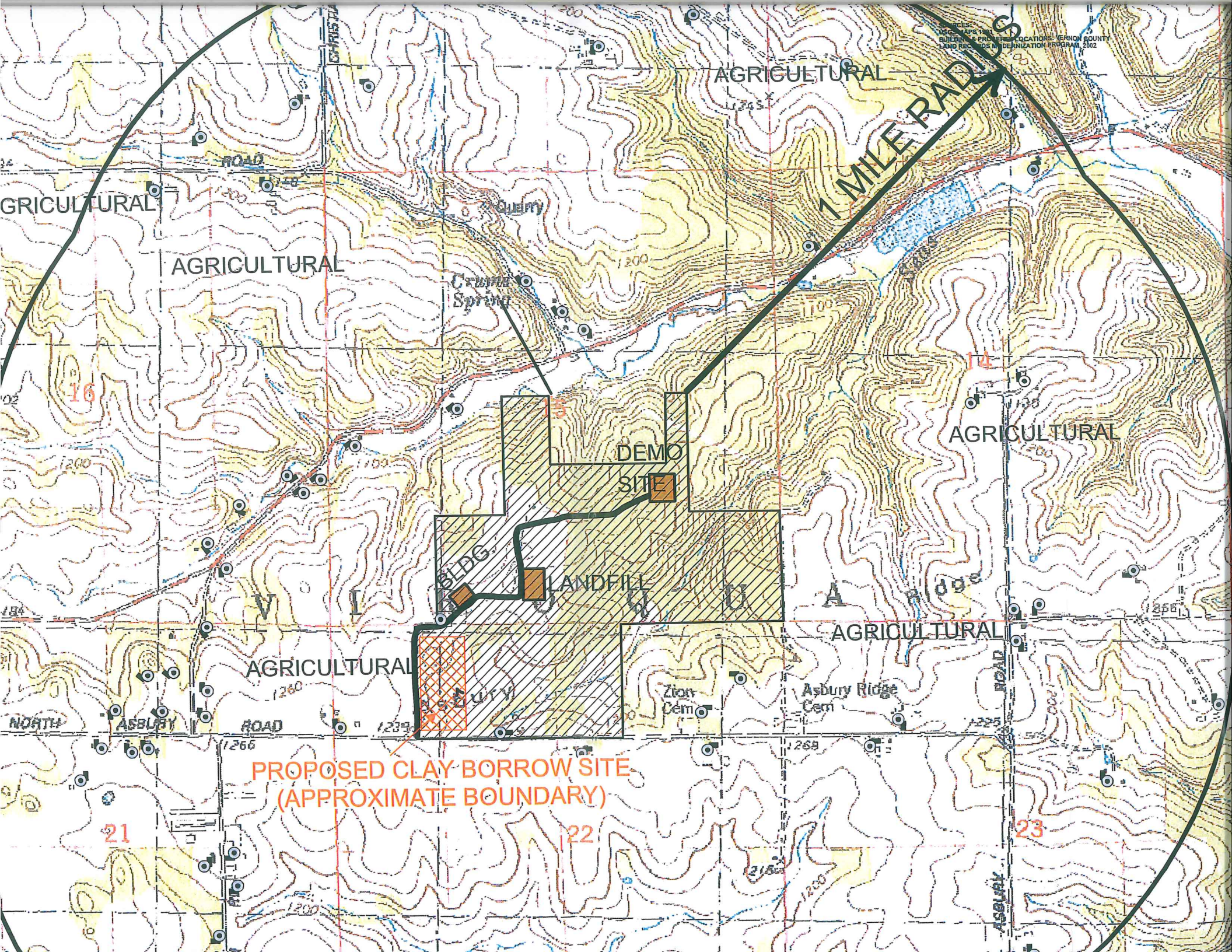
Figure 3 – Clay Borrow Site – WDNR Aerial Vicinity and Wetland Locator Map

WDNR Map of Seas Branch Earthen Dam



North

Figure 4
Vernon County Landfill - Clay Borrow Site
WDNR Map of Seas Branch Earthen Dam


1 MILE RADIUS
AGRICULTURAL
AGRICULTURAL
AGRICULTURAL
AGRICULTURAL
AGRICULTURAL
Quarry
Crumb Spring
DEMO SITE
BLDG
LANDFILL
PROPOSED CLAY BORROW SITE
(APPROXIMATE BOUNDARY)
Zion Cem
Asbury Ridge Cem
NORTH ASBURY ROAD
ASBURY ROAD
16
14
21
22
23