

KANSAS GEOLOGICAL SURVEY

1930 Constant Ave., Campus West
The University of Kansas
Lawrence, Kansas 66047-3726
phone 785-864-3965
fax 785-864-5317

February 21, 2005

Catherine J. Rocky, P.E., I.E.
Terracon Consults, Inc.
2111 West Harry Street
Wichita, Kansas 67213-3299

**Re: Permit Application Notification
Geologic Assessment
Wilson County Construction and Demolition Landfill**

Dear Ms. Rocky,

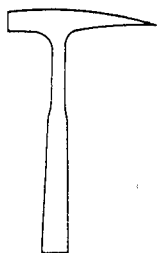
The Kansas Geological Survey (KGS) has requested that the Kansas Department of Health and Environment (KDHE) change in the wording of *Kansas Statutes Annotated ... Administrative Regulations Article 29-Solid Waste* with respect to "unstable areas." The change involves 28-29-302(h)(4) which states "... the applicant shall submit an approval or exemption for the siting of the new C&D unit with respect to stability from the Kansas geological survey (sic)." The KGS will continue reviewing geologic assessments provided by the applicant; however, the KGS has requested to no longer approve or exempt the siting of new C & D landfills with respect to stability.

The KGS has already provided you a review of the geologic assessment of the Wilson County C & D Landfill. Until the new regulations are published, the KGS requests that you contact John W. Mitchell at KDHE for information on how to proceed with your application. His contact information is:

John W. Mitchell
Chief, Waste Compliance, Enforcement & Policy Section
Bureau of Waste Management
Kansas Department of Health & Environment
Phone: (785) 296-1608

Sincerely,

Gregory C. Ohlmacher, P.G.
Engineering Geologist



KANSAS GEOLOGICAL SURVEY

February 7, 2005

Catherine J. Rocky, P.E., I.E.
Terracon Consults, Inc.
2111 West Harry Street
Wichita, Kansas 67213-3299

**Re: Permit Application Notification
Geologic Assessment
Wilson County Construction and Demolition Landfill**

*Additional
materials were
sent w/ this
response - part
of an Open-File
Report - see Greg
Oblmacher.*

Dear Ms. Rocky,

I have received the revised geologic assessment for the proposed expansion of the Wilson County Construction and Demolition Landfill dated January 19, 2005. After reviewing this material, I have the following comments:

1. Landslides and settlement related to soft clays are probably not problems at this site as long as the outlined procedures are followed.
2. While it is technically correct that the rolling hills in the vicinity of the proposed landfill expansion are not "cuestas" and that Young and Beard (1993) state that caves form in hills called "cuestas", I would question the utility of Young and Beard's statement for locating both caves and karst areas. Caves and karst areas tend to be controlled by the presence of soluble units and ground-water migration. If ground-water flow is present, then dissolution of the limestone might be occurring in the vicinity of the water table regardless of the morphology of the hillside.
3. An opponent of this C & D landfill might point to the brown gravelly clay unit with chert and claim that this unit is a residual soil on limestone and therefore provides evidence of karst. Alternatively, this unit could be a chert gravel. Aber (1988) has a description of chert gravels, and I've included a portion of Wagner's dissertation, which I referred to in my last letter. Additional interpretations of the brown gravelly clay may exist. What is the brown gravelly clay and what does it tell us about karst at this site? Please provide support for your answers in the geologic assessment.

Aber, J. S., 1988. Upland chert gravels of east-central Kansas, *In*, Mapes, G.[K]; and Mapes, R.H., (compls. and eds.); Regional geology and paleontology of Upper Paleozoic Hamilton quarry area in southeastern Kansas: Kansas Geological Survey, Guidebook Series, no. 6, pp. 17-19 {available at Wichita State University Library}

If you have questions, feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'G. C. Ohlmacher', with a long horizontal flourish extending to the right.

Gregory C. Ohlmacher, P.G.
Engineering Geologist

January 19, 2005



Terracon Consultants, Inc.
2111 West Harry Street
Wichita, Kansas 67213-3299
Phone 316.262.0171
Fax 316.262.6997
www.terracon.com

Mr. Gregory Ohlmacher, P.G.
Kansas Geological Survey
1930 Constant Ave.
University of Kansas
Lawrence, Kansas 66047-3726

Re: Permit Application Notification
Geologic Assessment
Wilson County Construction and Demolition Landfill
Wilson County, Kansas
Terracon Project No. 01047024

Dear Mr. Ohlmacher:

Terracon prepared a geologic stability assessment for the Wilson County Construction and Demolition Landfill (WCC&D), dated December 2 2004, and submitted that assessment to the Kansas Geological Survey (KGS) for comment and approval, in accordance with K.A.R. 28-29-300 (h). The geologic stability assessment was based upon information reviewed by Terracon as referenced in our report.

The KGS provided comment regarding Terracon's geological stability assessment in their letter dated December 23, 2004. Terracon is providing additional information regarding the geologic stability assessment for the Wilson County Construction and Demolition Landfill (WCC&D). To obtain additional information, file reviews were conducted at Wilson County and the Kansas Department of Health and Environment, Topeka, and additional reference material identified by the KGS was reviewed (see list at end of this document).

Site-specific Geologic Information

A "Soils and Geology Investigation, Proposed Addition to Wilson County Landfill Site, Altoona, Kansas" (dated June 22, 1983) and a "Report of Investigation of Site Soils and Geology, Proposed Addition to Wilson County, Landfill" (dated May 14, 1989), were obtained from KDHE and reviewed. These two documents pertain to the adjacent (north) Wilson County municipal solid waste landfill site, and the 2004/2005 proposed expansion area, respectively. These reports include boring information, an assessment of groundwater, and geotechnical testing results. Copies of these two reports are attached. In addition, groundwater monitor wells associated with the closed Wilson County municipal solid waste

landfill were installed on and adjacent to the proposed C&D expansion area in 1993, 1995, and 1997. Boring logs and/or WWC-5 forms for these wells were reviewed and are attached, and a portion of a Site Plan, showing the locations of these wells and the proposed C&D expansion area is also attached.

As indicated in the above-referenced 1989 report, bedrock was encountered in the borings performed in/near the proposed C&D expansion area at depths ranging from about 4 to greater than 18-feet below ground surface. Bedrock lithologies of "very hard gray limestone" and "very hard gray shale" were reported. The boring logs indicate drilling typically ceased after encountering about 1-foot of bedrock, however 3 of the 5 monitor wells logs penetrated 4, 5, and 18-feet of bedrock. Obvious indications of voids or karst features were not noted in the boring logs. Based upon Wagner (2000), the bedrock unit noted in the boring logs is likely the Lane/Bonner Springs Shale (Upper Pennsylvanian Age).

Groundwater was observed at depths of about 4 to 9-feet below ground surface (after 16 hours), in 3 of the 12 borings, and at depths of 7 to 11-feet in the monitor wells.

Landslides

The Wilson County solid waste landfill was in operation from 1977 to 1994, and the C&D landfill began operations in 1994. According to Wilson County, obvious indications of landslides have not been observed at the Wilson County landfill.

Pursuant to the C&D landfill design and operations, Wilson County will excavate the proposed C&D expansion area about 2 to 6-feet below grade, putting the base of the proposed C&D cells in the yellow-tan to brown clays (CL, see boring logs). C&D waste will be placed using accepted solid waste disposal practices; the waste will be placed in lifts and compacted following placement. C&D waste will be placed to approximately 12 feet above grade (in accordance with Wilson County's permit), covered with a low permeability soil cover, and graded to a slope of between 2% and 6% to divert runoff.

During routine landfill operations, surface water will be diverted from the active portion of the C&D landfill using soil berms. Contact water will be diverted to a contact water pond, on the southeastern portion of the site. As surface water impedes routine landfill operations, Wilson County will make efforts to prevent surface water from entering the active cell, and readily remove contact water that enters the cell, via the controls mentioned above. Therefore, the amount of water available to "wet" the clay shales in the subsurface will be minimized and shifting of wastes due to wet clay shales and/or "indiscriminate" placement of waste is not anticipated. Based upon landfill construction and operations, landslides are not anticipated to occur.

Karst

Based upon Beard and Young (1993), "Limestone Caves of the Osage Cuestas," "caves in the region are formed in hills called "questas," which are characterized by steep inclines on one side and gentle slopes on the other." The topography near the Wilson County landfill is not characterized by questas, but is gently rolling plains and lowlands between the outcropping escarpments. Further, caves are not identified in Wilson County in the above reference.

Veni (2002) and Davies, etal (1984) were obtained and reviewed. These documents tend to generalize karst potential based upon the presence of carbonate and evaporate rocks, and known and documented karst conditions. Specific references to karst features in Wilson County, Kansas were not observed by Terracon in these documents.

Based upon information provided by Wilson County personnel familiar with the landfill site and surrounding area since approximately 1976, obvious surface depression or significant settling of wastes, indicative of potential sinkholes or karst terrain has not been identified at the Wilson County landfill. Also, lost circulation, bit drop, obvious voids, or other potential indicators of karst are not mentioned on the boring logs reviewed.

General Comments

Based upon the information reviewed, stability issues for the proposed C&D landfill are not anticipated.

This Geologic Stability Assessment relied upon a review of readily available site specific documents provided by others and published information pertaining to the study area. This assessment was limited in scope and should not be considered a comprehensive assessment of the site. Terracon does not warrant the work of others who supplied information which may have been used during preparation of this report. No warranties, expressed or implied, are intended or made.

ADDITIONAL REFERENCES REVIEWED

Davies, W. E. and others, 1984, Engineering Aspects of Karst, The National Karst Map, www2.nature.nps.gov

Veni, G. 2002, Revising the Karst Map of the United States, Journal of Cave and Karst Studies, 64 (1), pp.45-50

Young, J. and Beard, J., 1993, Caves in Kansas, Kansas Geological Survey Educational Series 9

Please contact us if you have questions or need further information for your review.

Sincerely,

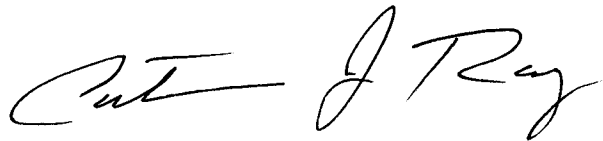
TERRACON

Prepared By:

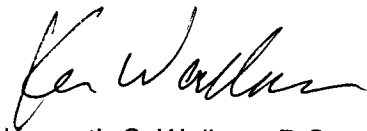


Jim Bruggeman, P.G.
Senior Project Manager/Hydrogeologist

Reviewed By:



Catherine J. Rocky, P.G., I.E.
Senior Project Manager

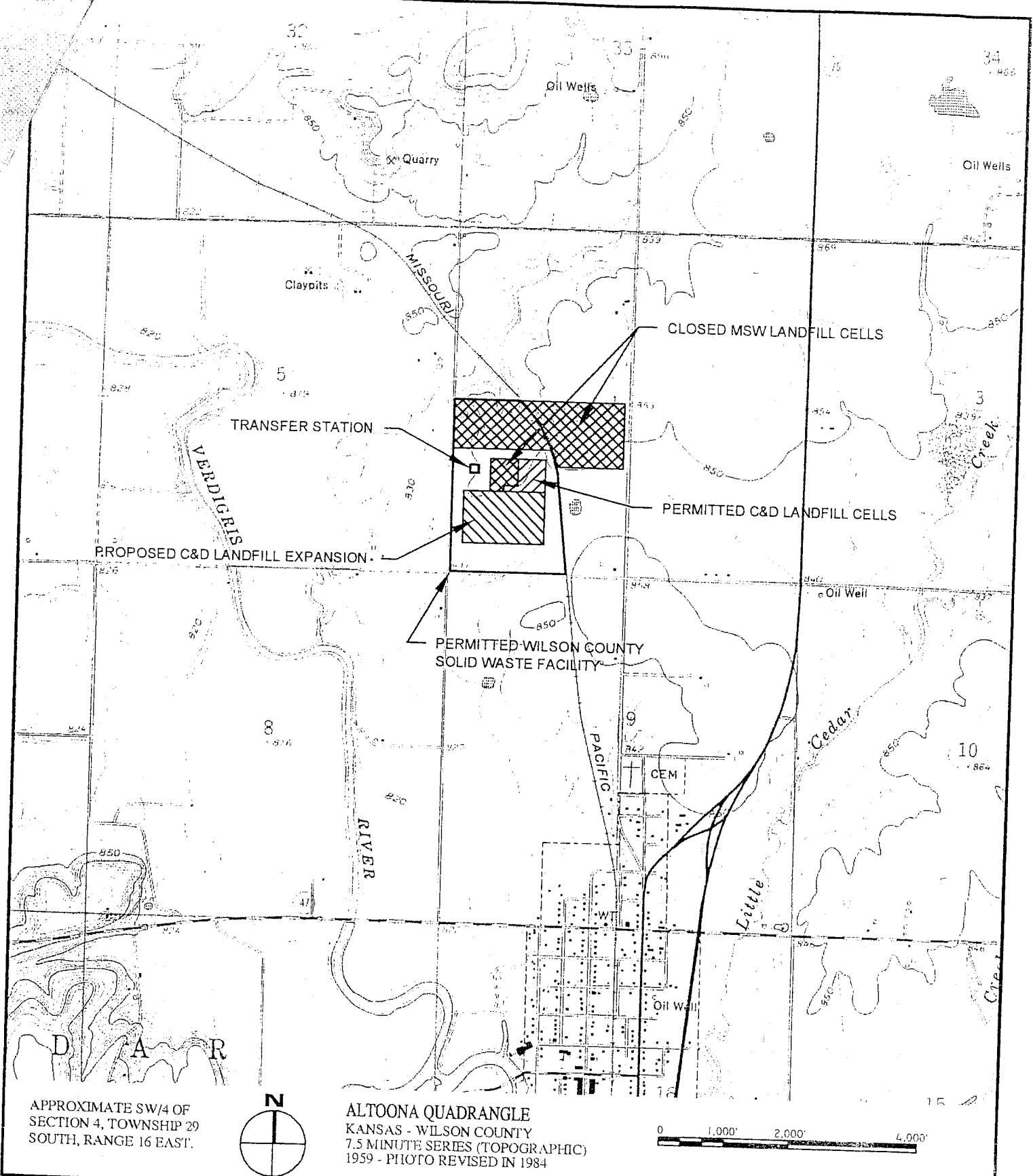


Kenneth C. Wallace, P.G.
Associate Principal, Sr. Project Manager

Attachments

cc: Mr. Kris Marple, Wilson County Coordinator

N:\ENV Projects\2004\01047024\Letters\KGSResponse2.doc



MAP IS INTENDED FOR GENERAL USE ONLY, NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE

Terracon

2111 WEST HARRY STREET
WICHITA, KANSAS 67213
Tel: 316.262.0171
Fax: 316.262.6997

WILSON COUNTY C&D LANDFILL
WILSON COUNTY SOLID WASTE FACILITY

ALTOONA, KANSAS

MARK	DATE	DESCRIPTION
PROJECT NO:	01067026	
CAD DWG FILE:	7026FJA.DWG	
DRAWN BY:	BCB	
CHK'D BY:	CJR	
DATE	01/01/01	

SHEET TITLE

LOCATION &
SITE MAP

FIGURE 1A

WOHLER GEOLOGICAL SERVICES
CONSULTING GEOLOGISTS
ST. MARYS, KANSAS 66536
913 + 437-2326

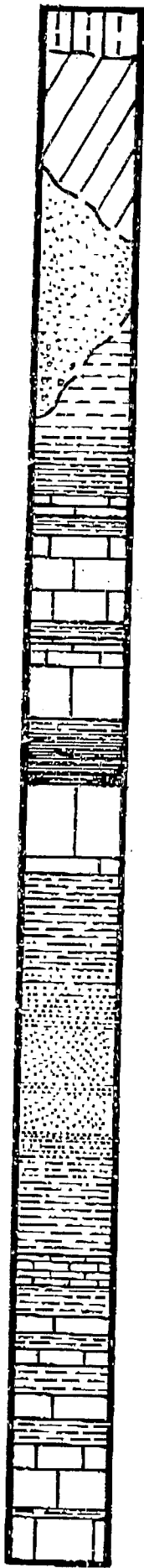
REPORT OF INVESTIGATION OF SITE SOILS & GEOLOGY
PROPOSED ADDITION TO WILSON COUNTY, KANSAS
SOLID WASTE LANDFILL - NORTH OF ALTOONA, KANSAS

PREPARED FOR WILSON COUNTY ENGINEER,
FREDONIA, KANSAS, and For

SCHWAB-EATON, INC., CONSULTING ENGINEERS
MANHATTAN, KANSAS

4-24-89


Elmer J. Wohler, C.P.G.



REPORT OF SOILS & GEOLOGICAL INVESTIGATION
SITE OF PROPOSED ADDITION TO
THE WILSON COUNTY, KANSAS SOLID WASTE LANDFILL

GENERAL:

This investigation has been carried out at the request of Schwab-Eaton, P.A., Consulting Engineers for this project, and was authorized by Mr. Allan Baker, the Wilson County Engineer.

The site location is immediately south of the the existing Wilson County, presently active, Landfill. The property is in the SW 1/4, Sec. 5, T.29S., R.16E.. The existing active Landfill was investigated by our personnel in 1983.

The purpose of this investigation has been to provide soils and geological information which will be used in evaluating the suitability of this proposed addition as a solid waste disposal area.

Twelve borings have been made on the site at locations staked by Schwab-Eaton personnel. These borings extended to depths ranging between 4.7 and 18 feet, dependant on the depth to bed-rock or other unsuitable conditions.

A Plot of Boring Locations, due to Schwab-Eaton, is appended to this report as page A-1. The detailed Logs of Borings, together with test information thereon are appended as pages B-1 through B-12.

SITE SOILS & GEOLOGY:

The earth materials encountered by this investigation consist of the following generalized sequence from top of ground downwards:

1. A topsoil of dark gray to very near black organic silty clay, with a range of thickness in the 12 borings of 0.5 to 2.5 feet, except in B-4 where a thickness of 3.0 feet was recorded due to presence in a terrace fill. Class OL-OH.
2. Gray to brownish gray clays underlay the topsoil in several areas. These tend to be quite stiff and include some CL-CH and CH class materials. The thickness range appears to be from 0 to near 4 feet.
3. Brown clay and silty to very fine sandy clay, sometimes containing scattered pebbles of limestone and brown chert. These materials have a thickness range from 0 to over 18 feet at this site. These materials are class CL.
4. A yellowish brown to tan usually silty clay of class CL, but tested to be CH in at least one location. The thickness of this unit is quite variable, from 0 to 6 feet.

SITE SOILS & GEOLOGY, (Cont'd.)

5. A brown gravelly clay to clayey gravel. Gravel content is generally coarse and of brown chert fragments, although skip grading is common. In most instances a visual classification would be GC. However in nearly all cases the stratum will contain some very thin discrete gravel "seams", some of which may be of limited areal extent.
6. Bedrock consisting of hard gray limestones and shales of the Stanton Limestone Formation.

The bedrock surface beneath units 1 through 5 is buried at depths ranging from as shallow as 4.0 feet to over 18 feet in the borings of this investigation. In general, the bedrock topography mirrors the surface.

GROUND WATER

Ground water was observed in four of the Borings at their completion and was again measured at some 15 to 17 hours after completion. These were Borings No.s 3, 6, 9, and 12. The water is encountered in each instance in the brown gravelly clays and clayey gravels of unit No.5. It is apparent that the occurrence of the ground water is related to the farm pond which is located approximately in the area between Boring B-12 and Borings 9 & 11. It is also controlled by the bedrock topography, and by the location of conservation terraces of improper grading that pond water in the general area of Borings B-3, and B-6.

In order to facilitate easier understanding of the influence of the bedrock surface on ground water movement at this site, we have constructed a map of the bedrock topography using a two foot contour interval. This map is appended as page A-2. Any water that infiltrates the clayey soils of the site will generally infiltrate downward to the highly impervious bedrock surface. There the direction of movement will change to a predominantly lateral motion through the clayey gravels just above the bedrock. Most such infiltrating water on this site will thence be directed south and eastward into the buried valley shown by the contours on page A-2. In this buried valley, which at least partially is a reflection of the surface topography, the underground flow is slowed or nearly stopped by the dam of the farm pond which borders the road at the south extremity of the property. (This is to the south of Borings B-11, and B-12, and in an area between them). The mounding of ground water in the eastern approximately 400-500 feet of this site is further aggravated by the terraces in the area of Borings 3 & 6 where improper grading and/or maintenance has brought about conditions where water is ponded and infiltrates into the gravels of unit No. 5.

RECOMMENDATIONS:

With the exception of stratigraphic unit No. 5, (the gravelly clay and clayey gravels), all the soil mantle materials present over this site, (Units No.s 1, 2, 3, & 4), can be utilized for construction and cover of cells of the proposed landfill. The existing top soil or unit No.1 should probably be stock piled for use as the final layer of cover over this fill. This unit is rich in organic matter and will allow the rapid establishment of sod and other vegetative cover over the completed landfill.

The gravel content of unit No. 5 appears higher here than in the existing landfill to the north. I do not believe solid waste should be emplaced within the gravelly materials, or directly on them. Rather, I recommend that at least 1.5 feet of highly compacted CL or CH materials be emplaced over the upper surface of the gravelly clays before emplacement of solid wastes.

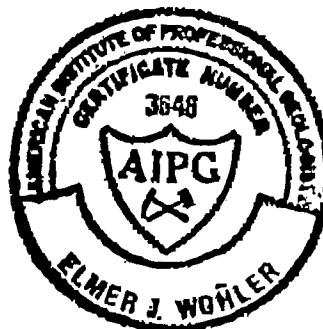
The water logging of the gravelly materials in the areas of Borings No.s 3, 6, & 9 can be at least partially relieved by the removal of the pond dam and the concurrent removal of those terraces where ponding occurs near Borings 3 and 6. I also would recommend the construction of a grassed waterway down through the areas of Borings 3, 6, 9, and the existing farm pond. Such a waterway should be constructed with as little deviation from a straight line as possible, and as steep a gradient as conditions will permit. Some backfilling of the existing pond bottom may be needed to prevent ponding and to maintain a near constant gradient for the waterway. If such backfilling is needed, it should be made with highly compacted CL or CH materials.

The above recommended drainage corrections should be made as soon as possible, and the construction and filling of this land fill site should begin at the west extremity and be worked evenly from west to east. This would allow the maximum possible time for the desired drainage to take place. Even with the best of results from the drainage, I seriously doubt that any of the property east of Borings 3, 6, 9, and east of the location of the farm pond will ever be useable for solid waste landfill.

If there are any questions regarding the investigation or the contents of this report, please contact me at (913) 437-2326.

Respectfully submitted,
WOHLER GEOLOGICAL SERVICES

Elmer J. Wohler
Elmer J. Wohler, C.P.G.
May 14, 1989



JOB: Add/n to Wilson Co. Landfill

BORING No. 1

LOCATION: A-1, S & E Survey

T.H. Elev. 849.6

DATE:

DRILLED BY: J.W.

LOGGED BY: E. Wohler

RIG No. 1

TOOLS 4/24/89
 4" CEA

Depth Interval From To		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG Scale: 1" = 5' Elev. LOG	SAMPLE RECORDS		
						No.	Type	Data
0.0	1.1	849.6	1	Topsoil of dk. brown nr. blk. silty Clay. (OL-OH)	849.6			
1.1	18.0	848.5	2	Stiff brown silty to slightly sandy Clay. (CL)	848.5			
18.0		831.6		TOTAL DEPTH		1	Auger	LL = 48 PI = 20
				NOTE: This boring dry when drilled and @ 16Hr		2	Auger	LL = 49 PI = 25
						3	U-38	LL = 42 PI = 18 W = 33%
					TD.			

KEY TO SAMPLE NOTES: U-38 = 38mm (1.46") dia. Undisturbed Sample.

U-51 = 51mm (2.00") dia. Undisturbed Sample.

S.P.T. = 1.375" dia. spl. secured by driven Std. Pen. Test. ("N" = Blow Count), 140Lb. 30" Fall for 1' Pen.

WGS BORING LOG

JOB: Add'n. to Wilson Co. Landfill

BORING No. 3

LOCATION: A-3, S & E Plot

T.H. Elev 841.3

DATE: 4/24/89.
4" CFA

DRILLED BY: E.J.W. LOGGED BY: E. Wohler

RIG No. 1

TOOLS

Depth Interval From To		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG Scale: 1" = 5' Elev. LOG	SAMPLE RECORDS		
						No.	Type	Data
0.0	1.8	841.3	1	Topsoil of near black org. silty clay. (OH-OL)				
1.8	4.2	839.5	2	Stiff grayish-brown silty clay. (CL)				
4.2	7.5	837.1	3	Yellowish-tan silty clay. (CL)				
7.5	8.0	833.8	4	Gravelly brown clay, (Cs. chert gvl.s.) (GC)	841.3 T.H.			
8.0	9.2	833.3	5	Med. hard olive-gray Shale.	839.5			
9.2	9.5	832.1	6	V. hard Limestone.	837.1	1	Auger	LL=49 PI=24 W=26%
9.5		831.8		TOTAL DEPTH, stopped on V. hd. L.S.	833.8 833.3			
				NOTE: Water elev. @ 16 hrs after drilling is 832.3	832.1 831.8 TD			

KEY TO SAMPLE NOTES: U-38=38mm (1.46") dia. Undisturbed Sample.

U-51=51mm (2.00") dia. Undisturbed Sample.

S.P.T.=1.375" dia. spl. secured by driven Std. Pen. Test. ("N"=Blow Count), 140Lb.-30" Fall for 1" Pen.

WGS BORING LOG

3

BORING No. 4

T.H. Elev 848.8

4/24/89

LOGGED BY: E. Wohler

TOOLS

4/24/89
4th CFA

Depth Interval		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG	SAMPLE RECORDS		
From	To				Scale: $F = \frac{1}{5}$			
					Elev. LOG	No.	Type	Data
0.0	3.0	848.8	1	Terrace backfill of near blk. org. silty clay. (OL-OH)				
3.0	5.4	845.8	2	Med. brown silty clay. (CL)				
5.4	9.5	843.4	3	Stiff yellow-brown clay. (CH)				
9.5	18.0	839.3	4	Brown gravelly clay, Cs. chert grvls in brown clay matrix. (GC)		1	Auger	LL=47 PI=23
18.0		830.8		TOTAL DEPTH in same.		2	Auger	LL=54 PI=30
				NOTE dry when drilled.				
								

KEY TO SAMPLE NOTES: U-38 = 38 mm (1.46") dia. Undisturbed Sample.

U-51 = 51 mm (2.00") dia. Undisturbed Sample.

S.P.T. = 1.375" dia. spl. secured by driven Std. Pen. Test. ("N" = Blow Count), 140 Lb. 30" Fall for 1" Pen.

WGS BORING LOG

JOB: Wilson Co., Ks.-Addition to Landfill

BORING No. 5

LOCATION: B-2, S & E Plot

T.H. Elev 841.7

DATE:

4/24/89
 4" CFA

DRILLED BY: F. I. W.

LOGGED BY: E. Wohler

RIG No. 1

TOOLS

Depth Interval		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG Scale: 1" = 5' Elev. LOG	SAMPLE RECORDS		
From	To					No.	Type	Data
0.0	0.9	841.7	1	Topsoil of nr. blk. org. silty clay. (OL-OH)				
0.9	4.3	840.8	2	V. stiff brown sandy clay. (CL)				
4.3	6.9	837.4	3	Stiff yellow-tan clay. (CL)				
6.9	9.5	834.8	4	Weathered soft to firm tan shale, grades to greenish gray.	841.7 T.H. 840.8 837.4			
9.5	9.7	832.2	5	Hard gray Shale.	834.8	1	U-38	LL=28 P.I.=14 W=23%
9.7		832.0	6	V. hard Limestone, TOTAL DEPTH, stopped on same.	832.2 832.0			
				HOLE IS DRY.	TD on hard L.S.			

KEY TO SAMPLE NOTES: U-38=38mm (1.46") dia. Undisturbed Sample.

U-51=51mm (2.00") dia. Undisturbed Sample.

S.P.T.=1.375" dia. spl. secured by driven Std. Pen. Test. ("N"=Blow Count), 140Lb.-30" Fall for 1" Pen.

WGS BORING LOG

JOB: Wilson Co., Ks.-Addition to Landfill **BORING No.** 6
LOCATION: B-3, S & E Plot **T.H. Elev** 837.5 **DATE:** 4/24/89

DRILLED BY: E.J.W. **LOGGED BY:** E. Wohler **RIG No.** 1 **TOOLS** 4" CFA

Depth Interval From To		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG Scale: f = 5'		SAMPLE RECORDS		
					Elev.	LOG	No.	Type	Data
0.0	1.8	837.5	1	V. dk. gray brown slightly organic silty clay. (OH-CL)					
1.8	3.2	835.7	2	Stiff brown silty clay. (CL)					
3.2	9.2	834.3	3	Stiff yellow-tan clay. (CL)					
9.2	14.4	828.3	4	Gravelly clay & brown clayey gravel. WET.					
14.4		823.1	5	V. hard Limestone, TOTAL DEPTH on L.S. WATER at 6.5 at 16.5 hrs.	837.5	T.H.			
					835.7	AAA			
					834.3		1	Aggr	LL=46 PI=21
					16.5 hrs	831.0			
					828.3		2	4-38	LL=40 PI=20 W=30%
					823.1				
						T.D. on L.S.			

KEY TO SAMPLE NOTES: U-38=38mm (1.48") dia. Undisturbed Sample.
 U-51=51mm (2.00") dia. Undisturbed Sample.
 S.P.T.=1.375" dia. spl. secured by driven Std. Pen. Test. ("N"=Blow Count), 140Lb.-30" Fall for 1" Pen.

BORING No. 7

T.H. Elev 838.8

4/24/89

RIG No. 1

TOOLS 4 "CFA

Depth Interval		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG	SAMPLE RECORDS		
From	To				Scale: $\Gamma = 5$	Elev.	LOG	No. Type Data
0.0	0.6	838.8	1	Topsoil of dk gray, nr. blk. silty Clay. (OH-OL)				
0.6	4.4	838.2	2	Stiff brown v. silty Clay. (CL)				
4.4	9.1	834.4	3	Stiff yellowish tan silty Clay. (CL)				
9.1	11.2	829.7	4	Brown gravelly Clay. (CL-GC)				
11.2	11.7	827.6	5	Soft tan weathered Shale.				
11.7	13.0	827.1	6	Hard light gray Shale.				
13.0		825.8		TOTAL DEPTH in hard Shale. <u>DRY</u>				

U-51 = 51 mm (2.00") dia. Undisturbed Sample.

WGS BORING LOG

JOB: Add'n. to Wilson Co. Landfill

BORING No. 8

LOCATION: C-2, S & E Plot

T.H. Elev. 837.7

DATE: 4/24/89

DRILLED BY: E.J.W.

LOGGED BY: E. Wohler

RIG No. 1

TOOLS: 4" CFA

Depth Interval		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG		SAMPLE RECORDS		
From	To				Scale: 1" = 5'	Elev. LOG	No.	Type	Data
0.0	0.5	837.7	1	Topsoil of v. dk. gray organic silty Clay. (OL-OH)					
0.5	4.1	837.2	2	Stiff gray silty Clay. (CL)					
4.1	7.6	833.6	3	Yellowish brown slightly silty Clay. (CL)					
7.6	9.0	830.1	4	Brown gravelly Clay. (CL)					
9.0	10.1	828.2	5	Weathered gray Shale.					
10.1	11.5	827.6	6	V. hard gray Shale.					
11.5		826.2		TOTAL DEPTH, stopped in V. hard L.S. DRY					
					837.7 T.H.				
					837.2				
					(2)				
					833.6		1	U-38	LL=59 PI=32 W=31%
					(3)				
					830.1		2	Auger	LL=39 PI=19
					828.9				
					827.6				
					(6)				
					826.2				
					T.D.				
					Ls				

KEY TO SAMPLE NOTES: U-38=38mm (1.46") dia. Undisturbed Sample.

U-51=51mm (2.00") dia. Undisturbed Sample.

S.P.T.=1,375" dia. spl. secured by driven Std. Pen. Test. ("N"=Blow Count), 140Lb.-30" Fall for Pen.

WGS BORING LOG

3

JOB: Add'n. to Wilson Co. Landfill

BORING No. 9

LOCATION: 14' N. & 8' W. of C-3,
S & E Plot.

T.H. Elev 835.2

DATE:
4/24/89

DRILLED BY: E.J.W.

LOGGED BY: E. Wohler

RIG No. 1

TOOLS 4" CFA

Depth Interval From To		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG Scale: 1" = 5' Elev. LOG		SAMPLE RECORDS		
							No.	Type	Data
0.0	1.5	835.2	1	Topsoil of dk. gray nr. blk. silty Clay. (OL-OH)					
1.5	3.1	833.7	2	Stiff gray-brown Clay (CL)					
3.1	7.8	832.1	3	Stiff brown Clay. (CL)					
7.8	10.8	827.4	4	Brown Clayey Gravel.. WET (GC)					
10.8		824.4	5	TOTAL DEPTH, stopped on hard gray Lime- stone. Water at 7.0 ft. on completion. At 4.1 ft. at 16 hrs.					
					835.2	T.H.			
					833.7				
					832.1				
					16 hr. 831.1				
							1	U-38	LL=47 P.L.=21 W=28%
					827.4				
					824.4				
						L.T.D on L.S.			

KEY TO SAMPLE NOTES: U-38 = 38 mm (1.46") dia. Undisturbed Sample.

U-51 = 51 mm (2.00") dia. Undisturbed Sample.

S.P.T. = 1.375" dia. spl. secured by driven Std. Pen. Test. ("N" = Blow Count), 140 Lb.-30" Fall for 1" Pen.

WGS BORING LOG

JOB: Add'n. to Wilson Co. Landfill

BORING No. 11

LOCATION: S & E Location D-2

T.H. Elev. 833.2

DATE: 4/24/89

DRILLED BY: E.J.W.

LOGGED BY: E. Wohler

RIG No. 1

TOOLS 4" CFA

Depth Interval		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG		SAMPLE RECORDS		
From	To				Scale: 1" = 5'	Elev. LOG	No.	Type	Date
0.0	1.0	833.2	1	Topsoil of dk. gray near blk. silty Clay. (OH-OL)					
1.0	2.5	832.2	2	Stiff gray Clay. (CL)					
2.5	8.0	830.7	3	V. stiff yellowish-tan clay. (CL)					
8.0		825.2	4	TOTAL DEPTH, stopped on V. hard Limestone. DRY HOLE					
					833.2 T.H.				
					832.2				
					830.7		1	Auger	LL=61 PI=35
							2	Auger	LL=36 PI=17
					825.2				
					T.P. on L.S.				

KEY TO SAMPLE NOTES: U-38=38mm (1.46") dia. Undisturbed Sample.

U-51=51mm (2.00") dia. Undisturbed Sample.

S.P.T.=1.375" dia. spl. secured by driven Std. Pen. Test. ("N"=Blow Count), 140Lb.-30" Fall for 1' Pen.

WGS BORING LOG

JOB: Add'n. to Wilson Co. Landfill

BORING No. 12

LOCATION: D-3, S & E Plot

T.H. Elev. 837.8

DATE:

4/24/89

DRILLED BY: E.J.W. LOGGED BY: E. Wohler

RIG No. 1

TOOLS 4" CFA

Depth Interval		Elev. Top of Stratum	Stratum No.	DESCRIPTION OF STRATUM	GRAPHIC LOG		SAMPLE RECORDS		
From	To				Scale: 1" = 5'	Elev. LOG	No.	Type	Date
0.0	3.8	837.8	1	Stiff Dk. brown silty Clay. (CL)					
3.8	6.5	834.0	2	V. Stiff gray Clay. (CL)					
6.5	11.0	831.3	3	Light gray V. damp Clay. (CL)					
11.0	13.0	826.8	4	Brown WET & SOFT slightly gravelly CLAY. (CL)					
				Water at 6.9' on completion. At 6.7 at 15 hrs.					
					837.8 T.H.				
					834.0		1	Reqd	LL=61 PI=38
					831.3				
					826.8				
					T.D.				

KEY TO SAMPLE NOTES: U-38 = 38 mm (1.46") dia. Undisturbed Sample.

U-51 = 51 mm (2.00") dia. Undisturbed Sample.

S.P.T. = 1.375" dia. spl. secured by driven Std. Pen. Test. ("N" = Blow Count), 140 Lb.-30" Fall for 1" Pen.

WGS BORING LOG

12



Boring locations are marked with a stake & both

BEDROCK TOPOGRAPHY MAP

Scale: 1" = 300' C.I. = 2 ft.

