

REPORT FOR:

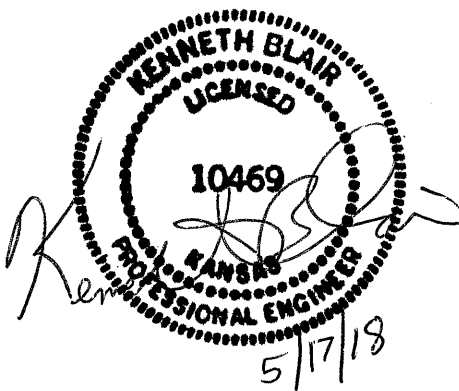
KANSAS HISTORICAL SOCIETY
6425 SW 6TH AVE.
TOPEKA, KS 66615

ATTENTION: RAY STOCKMAN, AIA AGENCY ARCHITECT

RE: FORT HAYS BLOCK HOUSE
HAYS, KANSAS

CFS No. 18-1042

DATE : MAY 17, 2018



Request:

Assessment of the Fort Hays Block House for the possible negative effects of adjacent golf course irrigation.

Observations:

The Fort Hays Block House was constructed of limestone in 1865. The main structure is a hexagon shape approximately 25 feet square and two stories tall. Two wings, one story high approximately 19'x17', were added on the north and south ends. All of the exterior walls are approximately two feet thick and constructed of locally quarried limestone blocks.

Over the years, some deterioration of the limestone blocks themselves has occurred. Some tuck pointing of the mortar joints has been instituted and the interior walls have been painted (see enclosed photos).

There is an adjacent golf course to the east of the Block House. It is approximately 40 feet to the edge of the fairway and 20 feet to the "dry line". The dry line is defined as the line where the vegetation stops showing signs of being irrigated (see enclosed survey).

The topography around the Block House is flat. Four borings were taken, one in the fairway, one between the dry line and the fairway, and two adjacent to the Block House. These soils were identified, classified, and evaluated by the Geotechnical Engineer. In addition, all samples were tested for water content in the laboratory. Humidity readings were also taken in the crawl space of the Block House (see enclosed geotechnical report).

Conclusions:

Our conclusion is the golf course irrigation is not negatively effecting the Fort Hays Block House. Our conclusion is based on the following bullet points:

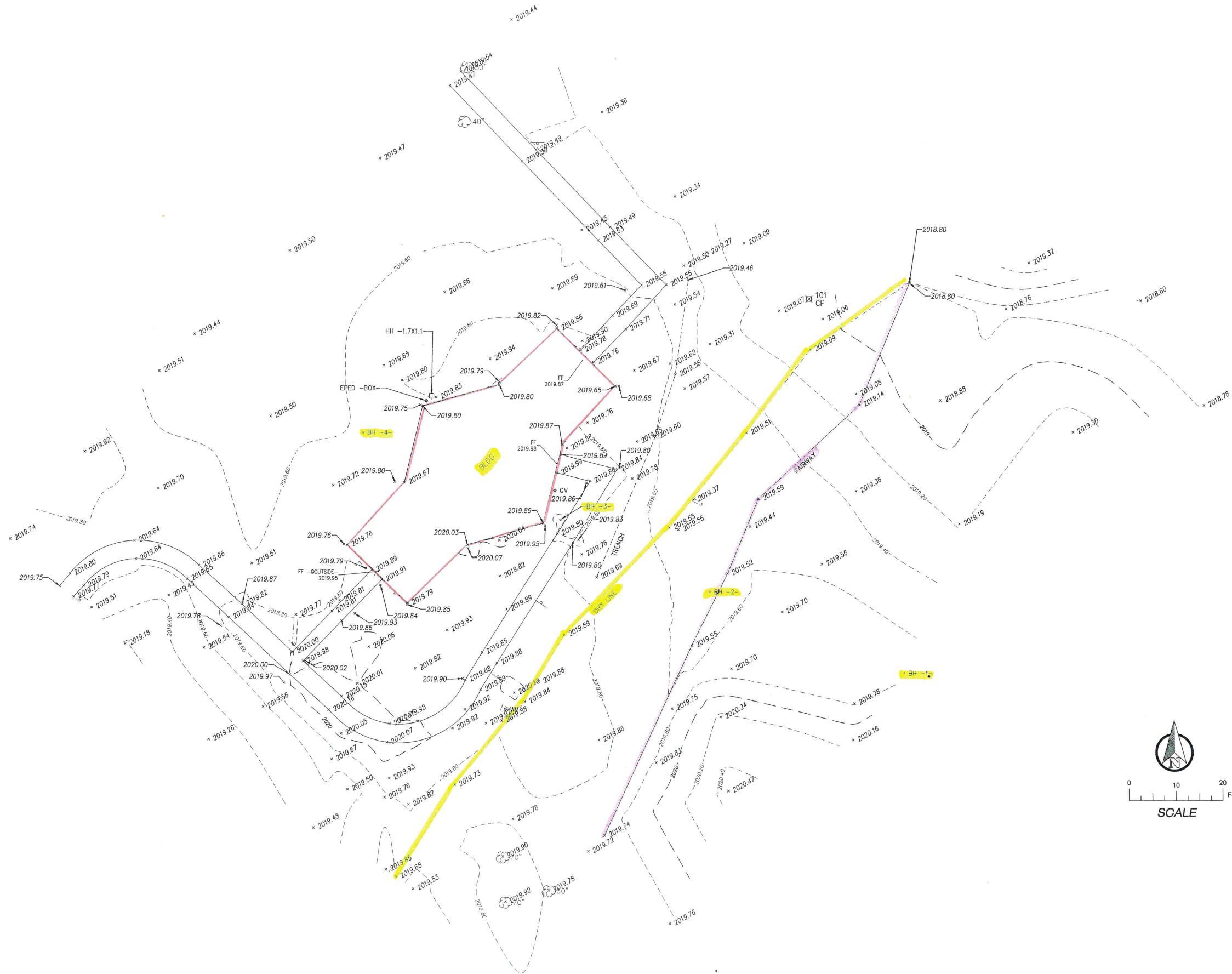
- There is approximately 20' of lean to fat clay soils between the Block House and the "dry line". The permeability of clay soils is very low and not conducive to the transmission of moisture.
- The slope of the surrounding surface around the Block House is essentially level.
- There are no signs of settlement damage to the structure itself.
- The borings next to the building show a significantly lower moisture content than the boring taken in the fairway.
- The condition of the exterior limestones is the same on the east side next to the golf course as it is on the west side facing away from the golf course.
- The high moisture content in crawl space is a typical occurrence from normal soil moisture.

We speculate that 150 years ago when this stone was quarried using horse drawn wagons, the stone was taken near the surface where the material itself of lower quality and prone to deterioration. 150 years of exposure to the weather and the elements are taking its toll on the stones themselves and over time you will get some natural degradation.

Recommendations:

1. Only use lime based mortar for tucking point the masonry walls. Do not paint the stone.
2. Encapsulate the crawl space area with 20 mil vapor barrier and install a dehumidifier set at 55% humidity.

J:\2018P\181042\CADD\Planning Zoning and Legal Survey\181042 Site Assessment Survey.dwg



SEAL:

CFS ENGINEERS
2830 SW WOODSIDE DR., TOPEKA, KS 66614
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18-1042

DEVELOPER:

OWNER:

**FORT HAYES BLOCK HOUSE
SITE ASSESSMENT SURVEY**

DATE: 05/15/18 DRAWN BY: CHECKED BY:

REVISIONS:		
NO.	DATE	DESCRIPTION

SHEET NUMBER:

ORIGINAL CONTRACT
DOCUMENT



**GEOTECHNICAL EXPLORATION
AND REVIEW**

Fort Hays Block House
Hays, Kansas
CFS Project No. 18-1042

Prepared For
Kansas Historical Society

May 1, 2018



Prepared by:
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Geotechnical Exploration And Review

FORT HAYS BLOCK HOUSE HAYS, KANSAS

Project Number: 18-1042
May 1, 2018

1.0 Introduction

Authorization

This report presents the results of a geotechnical exploration of the surrounding subsoil conditions for the existing Block House conducted for the Kansas Historical Society. The work for this project was performed in accordance with our Proposal dated march 21, 2018.

Purpose

The purpose of this exploration was to determine the soil and groundwater conditions between the site and the adjacent golf course. The information obtained is to be used by the Kansas Historical Society and their Architects and Engineers in the evaluation of the deterioration of the limestone blocks on the exterior of the Block House.

Scope

The scope of the exploration and analysis included a reconnaissance of the immediate site, the subsurface exploration, field and laboratory testing, humidity reading in the basement and photographs of the existing building.

The scope of services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statement in this report or on the boring logs regarding odors, colors, or unusual or suspicious items or conditions is strictly for the information of the client.

General

The general subsurface conditions reported were based upon soil samples obtained in the borings. There is a possibility that varying conditions may be encountered between boring locations. The Geotechnical Engineer warrants that the findings, recommendations, specifications, and professional advice contained herein have been presented after being prepared in accordance with generally accepted professional engineering practice in the fields of geotechnical engineering and engineering geology. No other warranties are implied or expressed.

2.0 Project Description

The Block House is a historical limestone sided building. Both the golf course and Block House are owned by the City of Hays, Kansas.

Site Location

The site is located in the southwest section of Hays, southeast of 183 By-Pass and directly northwest of the 6th green of the Hays golf course.

3.0 Topography

The site is relatively flat, sloping two (2) to three (3) feet from the edge of the golf course at the 6th green to the northwest side of the Block building. At the time the borings were performed, the site was a grass-covered.

4.0 Site Geology

Ellis County is located in the Great Plains province of the Interior Plains. It is mostly underlain by Cretaceous System rocks from the Mesozoic Era and newer Quaternary deposits. The Cretaceous System mainly consists of alternation layers of Shale, Limestone, and Chalk formations.

According to the Kansas Geological Survey, this particular site lies over Quaternary deposits of Loess and Terrace Deposits. Based on the geologic map, underlying this is likely the Blue Hill Shale member of the Charlie Shale Formation (Colorado Group, Upper Cretaceous Series).

5.0 Site Exploration

Scope

The field exploration to evaluate the soil and groundwater characteristics of the upper soils included a drilling the test borings and recovering auger cutting soil samples. The depth to groundwater, if encountered, was recorded in each test boring during drilling.

Four (4) test borings were drilled to depths ranging from eight (8) inches to three (3) feet below the existing ground surface. They were made in the locations determined by Cook, Flatt & Strobel Engineers. The field tests were located in the field by CFS Engineers and surveyed by CFS Engineers after drilling was completed. The locations are shown on the accompanying Boring Location Plan

After completion of the field testing, the excavations were backfilled with the excavated soil.

One humidity test was performed in the basement.

Drilling and Sampling Procedures

The hand auger borings were drilled using hand augering techniques. The soils were classified from the cuttings of the augered soil. The hand augering procedure included retracting the auger at approximately six (6) inch intervals to remove the material retained in the auger.

All of the samples recovered were identified, classified, and evaluated by the Geotechnical Engineer.

Water Level Measurements – Water level measurements were taken during the test boring operations, if encountered.

Ground Surface Elevations – Ground surface elevations of the borings were not surveyed, and are not available.

Boring logs are included in Appendix B. Field logs included visual classification of the materials encountered during drilling, as well as drilling characteristics. Boring logs represent the CFS engineer's interpretation of the field logs combined with laboratory observations and testing of the samples. The stratification boundaries indicated on the boring logs were based on field observations, an extrapolation of information obtained by examining samples from the borings and comparisons of soils and/or bedrock types with similar engineering characteristic. Boundary locations are approximate, and the transitions between soil and bedrock types may be gradual rather than clearly defined.

Laboratory Testing Program

In addition to the field exploration, a supplemental laboratory testing program was conducted to evaluate additional engineering characteristics of the on-site soils and rock necessary in analyzing the behavior of the foundation systems for the proposed structure.

The laboratory testing program included the following tests:

- Supplementary visual classification (ASTM D2488) of all samples
- Water content (ASTM D2216) of all samples

Subsurface Conditions

General

The types of subsurface materials encountered in the test borings have been classified according to the Unified Soil Classification System (USCS). They are described on the Boring Logs. The results of the field tests, water level observations, and laboratory tests are presented on the Boring Logs (Appendix B).

The following presents a general summary of the major strata encountered during our subsurface exploration and includes a discussion of the results of field and laboratory tests conducted. Specific subsurface conditions encountered—including field tests, lab tests, and water level observations—at the boring locations are also presented on the individual boring logs in Appendix B of this report

Overburden Material

A topsoil layer (grass cover and roots) of approximately twelve (12) to 18 inches covered the site. Underlying the topsoil was between six (6) and twelve (12) inches of grayish-brown lean to fat clay (CL-CH) with trace roots still present. At a depth of 18 to 24 inches below ground surface (bgs) this clay became more yellowish-brown, and seemed to contain traces of chalk.

Groundwater Conditions

Groundwater was not encountered in any of the borings. However, it is not unusual for seasonal groundwater to be encountered on top of the bedrock.

Groundwater observations were made both during and after completion of drilling operations. All boring remained dry and no visible groundwater seepage was observed.

Refusal Materials

Refusal materials were encountered in Boring B1, closest to the golf course of the borings. Boring B-1 terminated on limestone at approximately eight (8) inches bgs. It was reported to our field crew that there is an upper limestone layer in the area based on road cuts.

Testing Results

Boring B-1 soils (on the golf course) were in the wet condition at moisture contents of 32 and 39 percent. The remainders of the soil samples were considered moist at moisture content ranges of 13 to 24 percent.

Representative samples of the soils were placed in sample bags. They are now stored in the laboratory for further analysis if desired. Unless a request to the contrary is received, all samples will be disposed of sixty (60) days from the issuance date of this report.

6.0 Humidity Test

Test Result

Humidity and temperature measurements were made in the crawl space of the Block House. Results the morning of April 26th, 2018, after leaving the meter in place over night, recorded a temperature of 55 degrees Fahrenheit and a relative humidity of 85%.

7.0 General Comments

From the borings preformed, the irrigation system at the golf course does not appear to be causing moisture/water conditions on the Block House site. Boring B1 on the golf course had wet sols. The three borings on the Block House site had soil conditions described as moist or at natural conditions.

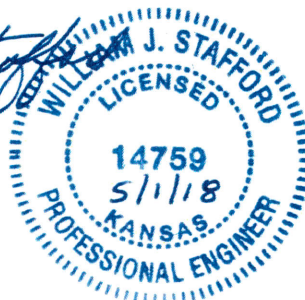
If there are any questions concerning the data presented, please feel free to contact CFS Engineers.

Respectfully submitted,

COOK, FLATT & STROBEL ENGINEERS, P.A.

William J. Stafford, P.E.

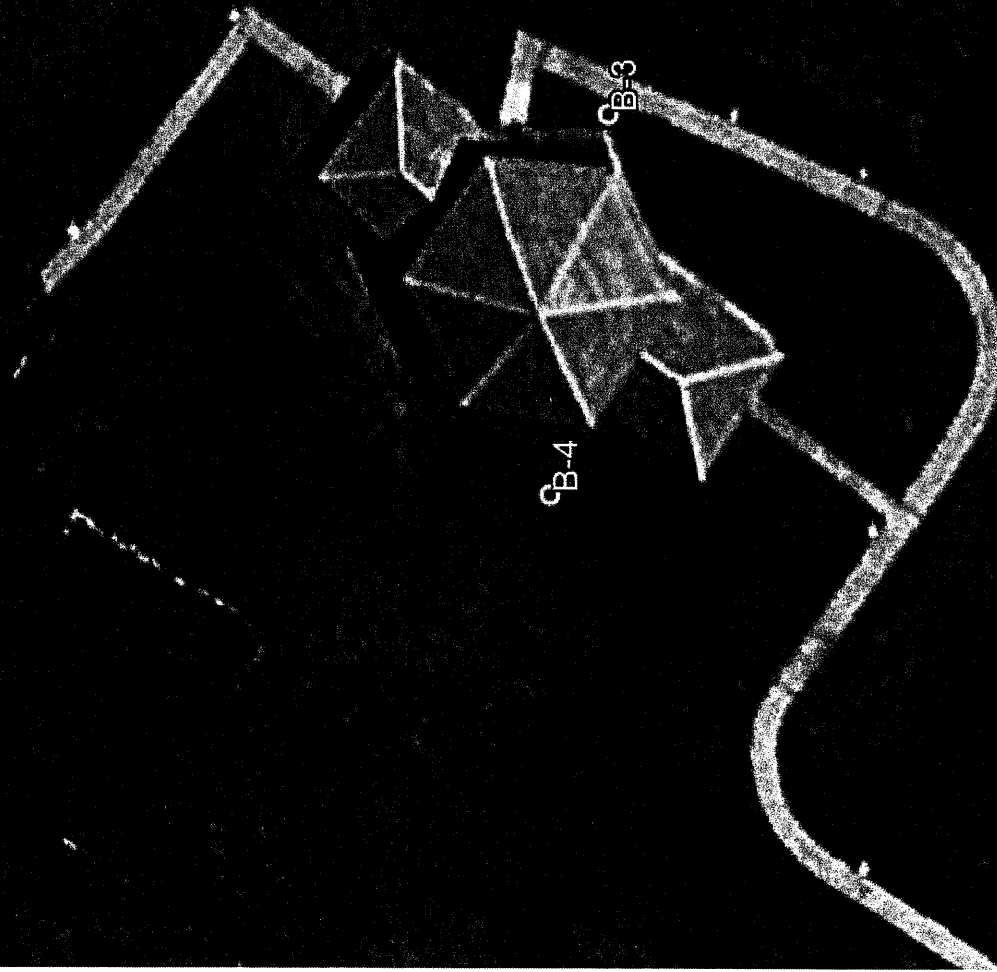
Senior Geotechnical Engineer



Appendix A: Boring Location Plan

Boring Location Plan

Fort Hays Historical Site
18-1042



80 ft

Google Earth

© 2018 Google

Appendix B: Boring Logs



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Kansas City, Kansas 66103
Telephone: 913-627-9040

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT	Kansas Historical Society	PROJECT NAME	Fort Hays Block House
PROJECT NUMBER	18-1042	PROJECT LOCATION	Fort Hays, Kansas
DATE STARTED	4/26/18	COMPLETED	4/26/18
DRILLING CONTRACTOR	CFS Engineers	GROUND ELEVATION	
DRILLING METHOD	HA	HOLE SIZE	
LOGGED BY		CHECKED BY	
NOTES			
GROUND WATER LEVELS:		AT TIME OF DRILLING ---	
		AT END OF DRILLING ---	
		AFTER DRILLING ---	

GENERAL BH / TP / WELL - GINT STD US.GDT - 4/27/18 16:06 - C:\USERS\JUSTIN\GOOGLE DRIVE\ACTIVE GEOTECH PROJECTS\18-1042 FORT HAYS BLOCK HOUSE\FT HAYS BORING LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0				
	AU 1			Medium to dark brown, moist, stiff, lean CLAY (CL), with ORGANICS [TOPSOIL]
	AU 2			LIMESTONE, pale brown, moderately soft, chalky [likely buried rubble]
			0.6 0.7	Boring terminated on Hand Auger refusal on buried LIMESTONE at 8 inches.



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BORING NUMBER B-3

PAGE 1 OF 1

CLIENT Kansas Historical Society PROJECT NAME Fort Hays Block House
PROJECT NUMBER 18-1042 PROJECT LOCATION Fort Hays, Kansas
DATE STARTED 4/26/18 COMPLETED 4/26/18 GROUND ELEVATION _____ HOLE SIZE _____
DRILLING CONTRACTOR CFS Engineers GROUND WATER LEVELS:
DRILLING METHOD HA AT TIME OF DRILLING _____
LOGGED BY _____ CHECKED BY _____ AT END OF DRILLING _____
NOTES _____ AFTER DRILLING _____

GENERAL BH / TP / WELL - GINT STD US.GDT - 4/27/18 16:06 - C:\USERS\JUSTIN\GOOGLE DRIVE\ACTIVE GEOTECH PROJECTS\18-1042 FORT HAYS BLOCK HOUSE\FT HAYS BORING LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0				
	AU 1			Medium to dark brown, moist, stiff, lean CLAY (CL), with ORGANICS [TOPSOIL]
	AU 2			
1				
	AU 3			
	AU 4			
2				
	AU 5			
	AU 6			
3				
				Boring terminated at 36 inches below ground surface.
				Boring terminated at 36 inches below ground surface.



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BORING NUMBER B-4

PAGE 1 OF 1

CLIENT	Kansas Historical Society	PROJECT NAME	Fort Hays Block House
PROJECT NUMBER	18-1042	PROJECT LOCATION	Fort Hays, Kansas
DATE STARTED	4/26/18	COMPLETED	4/26/18
DRILLING CONTRACTOR	CFS Engineers	GROUND ELEVATION	
DRILLING METHOD	HA	HOLE SIZE	
LOGGED BY		CHECKED BY	
NOTES			
GROUND WATER LEVELS:		AT TIME OF DRILLING ---	
		AT END OF DRILLING ---	
		AFTER DRILLING ---	

GENERAL.BH / TP / WELL - GINT STD US.GDT - 4/27/18 16:06 - C:\USERS\JUSTIN\GOOGLE DRIVE\ACTIVE GEOTECH PROJECTS\18-1042 FORT HAYS BLOCK HOUSE\FT HAYS BORING LOGS.GPJ

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0				
	AU 1			Medium to dark brown, moist, stiff, lean CLAY (CL), with ORGANICS [TOPSOIL]
	AU 2			
1	AU 3			
	AU 4			Gray-brown, moist, stiff, lean to fat CLAY (CL-CH), trace ORGANICS
2	AU 5			
	AU 6			Brown to yellow-brown, moist, stiff, lean to fat CLAY (CL-CH), trace chalk
3				

Boring terminated at 36 inches below ground surface.

Appendix C: Site Photographs









Appendix D: Laboratory Test Results



ENGINEERS

Water Content Determination

Project: Ft. Hays Block House

Location: Hays, Kansas

Project #: 18-1042

Date: 30 April 2018

Test Performed By: JLC/BT

Checked By: JLC/PD

Boring	Sample	Can #	Wt. of Can	Wt can+wet	Wt can+dry	Wt water	Wt dry	M/C (%)
B-1	0-6		2283	6287	5154	1133	2871	39.5%
B-1	6-12		2255	5547	4750	797	2495	31.9%
B-2	0-6		2221	5568	4911	657	2690	24.4%
B-2	6-12		2241	6156	5551	605	3310	18.3%
B-2	12-18		2242	6288	5655	633	3413	18.5%
B-2	18-24		2272	6256	5724	532	3452	15.4%
B-2	24-30		2248	5754	5274	480	3026	15.9%
B-2	30-36		2271	6404	5840	564	3569	15.8%
B-3	0-6		2225	7253	6690	563	4465	12.6%
B-3	6-12		2297	6504	5799	705	3502	20.1%
B-3	12-18		2293	6138	5446	692	3153	21.9%
B-3	18-24		2242	6285	5585	700	3343	20.9%
B-3	24-30		2289	5672	5160	512	2871	17.8%
B-3	30-36		2278	7080	6376	704	4098	17.2%
B-4	0-6		2292	5200	4832	368	2540	14.5%
B-4	6-12		2279	5352	4939	413	2660	15.5%
B-4	12-18		2275	3210	3070	140	795	17.6%
B-4	18-24		2275	6976	6321	655	4046	16.2%
B-4	24-30		2261	6549	5989	560	3728	15.0%
B-4	30-36		2258	4506	4209	297	1951	15.2%