DOCUMENT 00 31 32 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. A geotechnical investigation report for Project, prepared by Mid-State Engineering and Testing Inc., dated April 22, 2014, is available for viewing as appended to this Document.

C. Related Requirements:

1. Document 00 21 13 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 00 31 32

MID-STATE
ENGINEERING & TESTING

REPORT OF GEOTECHNICAL INVESTIGATION

TWIN RIVER SCHOOL ADDITION
816 WILLARD AVENUE
GENOA, NEBRASKA

M.S. PROJECT NO. 200-83-20
APRIL 22, 2014
A-8591

Prepared for:

Twin River School District
816 Willard Avenue
Genoa, NE. 68640

TABLE OF CONTENTS

APPENDICES

MID-STATE
ENGINEERING &
TESTING, INC.

REPORT OF GEOTECHNICAL INVESTIGATION

TWIN RIVER SCHOOL ADDITION
816 WILLARD AVENUE
GENOA, NEBRASKA

M.S. PROJECT NO. 200-83-20
APRIL 22, 2014
A-8951

INTRODUCTION

This report presents the results of a geotechnical investigation performed at the site of a proposed detached addition to the west side of the existing public school building located at 816 Willard Avenue in Genoa, Nebraska.

Included in this investigation were five (5) soil borings, laboratory testing, and a report of conclusions and recommendations. The scope of our report was limited to the following:

- Identify insitu soil conditions,
- Evaluating the engineering properties of the soils encountered,
- Recommending types and depths of foundation elements,
- Evaluate soil bearing capacity and settlement,
- Providing recommendations for earthwork and soil related construction with respect to the soils encountered.

This report was prepared by Mid-State Engineering and Testing, Inc. by a professional engineer registered in the State of Nebraska. Recommendations are based on the applicable standards of the profession at the time of this study. This report was prepared for the exclusive use of the Owner for specific application to the planned construction. All work was conducted in accordance with generally accepted soil and foundation engineering practices.

11 EAST 11TH STREET
KEARNEY, NEBRAKSA 68847
PHONE (308)-237-0187

279 ROAD D
COLUMBUS, NEBRASKA 68601
PHONE (402)-562-7824

PROJECT DESCRIPTION

Based on the provided preliminary design information, we understand construction at the existing K-12 school will include an approximate 12,000 square feet, single story, slab-on-grade classroom addition. The proposed expansion will be situated in the area of an existing elevated concrete playground. A finish floor elevation of 128.5 feet (local datum) is proposed at this time. This will match the 2nd floor elevation of the existing school building. An elevated walkway will connect the addition to the existing school building.

Assuming conventional steel frame and/or masonry construction, maximum structural loads are estimated to be on the order of 80 kips for isolated columns and 2 – 5 klf for walls.

The site is situated near the base of a relatively steep slope, with the concrete playground cut into the slope to level the area. Grades rise steeply as you travel north. The actual building area is relatively level with about 3' variance in elevation across the site.

FIELD WORK

Field exploration was performed on March 24, 2014. A total of five (5) soil borings (DH-1 thru DH-5) were performed at the locations indicated on the included Site Plan (Appendix A).

The exploratory borings were advanced to depths of 10 to 15 feet below existing site elevations with a truck-mounted rotary drilling rig using continuous flight augers.

Soil samples were obtained at the sampling intervals noted on the Boring Logs (Appendix A). Recovered samples were extruded in the field, sealed in plastic containers, labeled, and protected for transportation to the laboratory for testing. Undisturbed samples, designated "U" samples, were obtained with a 3.0-inch (outside diameter), thin-walled, tube samplers hydraulically pushed in general accordance with ASTM D1587-83 (Thin walled Sampling of Soils).

The field Boring Logs was prepared by an experienced soils engineer in general accordance with ASTM D2488-84, (Description of Soils by the Visual-Manual Procedure). Stratification lines represent the approximate boundary between soil types. In-Situ, the transition between sediments may be gradual. Water level readings were made in the drill holes at the times and under conditions noted on the boring logs.

LABORATORY TESTING

Based on site stratigraphy and the construction proposed, a testing program was established to evaluate the engineering properties of the bearing strata. Specific tests performed include:

- Soil Moisture Contents
- Unit Weights Determinations
- Unconfined Compression Tests
- Atterberg Limit Tests
- A One-Dimensional Consolidation Test

All tests were conducted in general accordance with current ASTM or state-of-the-art test procedures. Laboratory test results are presented on the Boring Logs (Appendix B) and the Summary of Soil Tests (Appendix C).

Soil moisture Content and Unit Weight information was used to determine the overall uniformity/variability of the site soils for evaluation of bearing capacity and settlement.

Atterberg Limits testing were used to classify the soils, based on the Unified Soils Classification System, and to quantify the plasticity characteristics of the site soils.

Unconfined Compression Tests define the stress/strain characteristics and related shear strengths of the soils.

The One-Dimensional Consolidation test defines the load/settlement relationship of the bearing soils.

Based on the results of the testing program, the field log was reviewed and supplemented as shown in Appendix A. These final logs are a summation of visual evaluations performed in field and lab, and the additional information gained through the laboratory testing program.

SITE CONDITIONS

The proposed addition will be located on the west side of the existing school building. A concrete playground area encompassed the majority of the proposed addition area. The remainder of the proposed building site is a grassy area. Currently the site varies approximately 3-4 feet in elevation across the site, with site drainage towards the south.

Prior development in this general area included 2 or more residential homes, possibly with basements, cellars and cisterns. Also approximately 5 feet of fill was placed to elevate the south edge of the concrete playground areas. The north side is cut into undisturbed soils.

SOIL CONDITIONS

This site is situated on a sloping hillside overlooking the Loup River Valley in Genoa, NE. The generalized subsurface profile for this region consists of slope wash deposited soils which overlie Loessal deposits atop water deposited sediments (Alluvium) of various ages. Within the 15 feet depths investigated, the undisturbed site soils encountered consist of cohesive Colluvial and slope wash sediments which overlie Peorian and Loveland Age Loess deposits. In addition, 3 to 7 feet of old fill was encountered in the three south side borings.

The old fill soils encountered in DH's 3, 4 and 5 extended to depths of 3, 7 and 4 feet respectively. The majority of these old fill soils were described as dark grey brown, brown and light brown, firm lean clays with trace amounts of gravel and brick pieces. In the areas encountered, these old fill soils exhibit the following range in engineering properties.

Moisture Content (%)	10 – 21
Dry unit Weight (pcf)	91 – 98

Plastic Index 29

Based on laboratory and visual evaluation, these deposits generally classify as moderately plastic clays (CL).

Colluvial Deposits are naturally occurring sediments, which accumulate through the action of wind and local wash, generally at the base of surrounding hillsides and in valley bottoms. The Colluvial deposits were encountered directly below the topsoil in DH's 1 and 2 extending to a depth of about 2 feet. An approximate 5' thick layer of Colluvial and slope wash deposits were also encountered below the fill in DH's 3 and 5. These deposits were described as dark brown, brown and dark grey brown, slightly moist to moist, firm to stiff, lean clays. Lab evaluation indicates the following range in in-situ engineering properties.

Moisture Contents (%) ..... 10 – 22
Dry Unit Weights (pcf) ..... 82 – 102
Unconfined Compressive Strength (tsf) ..... 0.6 – 3.3
Plastic Index 26

Based on Atterberg limits and Visual Evaluation these soils generally classify as moderately plastic lean clays (CL).

Peorian Age Loess deposits were encountered at a depth of 2 feet in DH-1 and below the fill and Colluvial sediments in DH's 3-5. these deposits were described as light brown, slightly moist to moist, firm lean clays. These deposits exhibit the following range in insitu engineering properties.

Moisture Content (%) ..... 9 – 21
Dry Unit Weight (pcf) ..... 89 – 91
Unconfined Compressive Strength (tsf) 1.1
Plastic Index 9

Based on laboratory and visual evaluation, these deposits classify as low to moderate plastic silty clays and clayey silts (CL/ML).

Loveland Age Loess deposits were encountered at a depth of two feet in DH-2, extending throughout the 15' boring depth. These deposits were described as light red brown, moist, stiff lean clays. These deposits exhibit the following range in insitu engineering properties.

Moisture Content (%) ..... 18 – 24
Dry Unit Weight (pcf) ..... 98 – 102
Unconfined Compressive Strength (tsf) 1.1

These deposits visually classify as moderately plastic lean clays.

GROUNDWATER

Groundwater was not encountered within the 10 to 15 foot boring depths across the site. Groundwater below this level is not expected to be a factor in the construction proposed at this time. It should be noted, however, while free groundwater does not appear to be a concern, based on the cohesive nature of the site soils, groundwater levels will fluctuate depending on weather patterns, irrigations practices, or other factors which may differ from these at the time of drilling.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

In the event the recommendations of this report are followed, this site appears suitable for construction of the proposed school addition. Groundwater was not encountered within a depth expected to affect construction and with proper site prep, the soils encountered are generally capable of supporting anticipated foundation loads.

The primary consideration for project development is the control of total and differential settlement. Principle factors include the extent of undocumented old fill and backfill material present on the site and the inconsistencies within the undisturbed site soils.

The existing old fill soils encountered in the south side borings was generally found to be marginally to poorly compacted relative to the support of the proposed structure. Consequently, we recommend all existing old fill soils be removed from the building site. The majority of these old fill soils will be suitable for reuse as structural fill for this project.

The majority of the undisturbed soils within the zone of influence of the building footings consist of Peorian Age Loess deposits and slope washed Peorian Age soils. The primary exception being the northeast corner (DH-2) which consist of Loveland Age sediments.

The slope wash and upper Peorian Age soils are considered to be moderately compressible and potentially collapsible, while the Loveland Age soils are relatively stiff and only slightly compressible. Consequently, the control of differential settlement is the primary issue for this project.

Based on the soil conditions indicated, and the relatively light loads associated with the single story slab-on-grade structure, it appears the most cost effective approach for this project is to perform the corrective action as needed to address the old fill issues, and to utilize a conservative bearing capacity for foundation design to control settlement.

The primary exception being the connecting walkway footing which may require some remedial site work if isolated column loads exceeded 40 kips.

We recommend all stripped and overexcavated subgrades be observed and approved by the Engineer prior to placement of structural fill placement. Any substandard conditions identified will need to be corrected as directed by the engineer.

Recommendations regarding these and other aspects of this project are included in the following section of this report.

FOUNDATION ANALYSIS

If the recommendations presented in this report are followed, this site appears suitable for the use of a conventional shallow foundation system. The selection of an allowable soil bearing pressure for foundation design must fulfill two requirements. First, structural loads must be sufficiently less than the ultimate bearing capacity of the foundation to insure stability. Second, settlement must not exceed an amount, which will produce adverse behavior of the superstructure.

In order to meet the previous criteria, we have explored both the bearing capacity and load settlement characteristics of the on-site soil, assuming maximum loads of 4 klf for walls and 40 kips for isolated columns. The bearing capacity is based on a factor of safety of 3 against the full dead load plus normal live loads. A maximum total settlement of 1 inch and differential settlements of ½ to ¾ inch are generally considered acceptable and were used in our analysis. The allowable bearing pressure is expressed in terms of the net pressure transferred to the soil.

In the event the recommendations presented in this report are followed, a net allowable soil bearing pressure of up to 1500 pounds per square foot is recommended for shallow foundation elements bearing within approved undisturbed site soils or controlled structural fill. Foundation elements designed in this manner will limit maximum total settlement, due to the foundation loads, to approximately 1 inch or less, while limiting differential settlement to approximately ½ inch per 100 lineal feet.

For foundation elements greater than 3 klf and less than 5 klf (walls) and for isolated columns caring loads of 40 to 60 kips, we recommend the footing be situated atop a minimum of two feet of structural fill. In the event these recommendations are followed, a net allowable soil bearing capacity up to 2000 psf is recommended for foundation design. Performance of this work will limit maximum total settlement to 1 inch or less. Additional evaluation will be required for structural loads exceeding 5 klf for walls and 60 kips for isolated columns.

We recommend exterior footings and footings in unheated areas be founded at a minimum depth of 40 inches below surrounding grade for frost protection. Interior footings may be placed directly below the floor slab. All footings will require steel reinforcement and should conform to local code sizes.

We recommend concrete for footings have a minimum cement content of 516 lb/yd^3 and a minimum compressive strength of 3000 psi. Most 5½ sack, sand and gravel mixes will meet these requirements. We also recommend structural concrete be steel reinforced and conform to local building code requirements.

EARTHWORK AND EXCAVATIONS

Prior to overall site grading, we recommend topsoil and vegetation be stripped and stockpiled and the site excavated as needed to remove existing old fill soils and provide fill below footings in required areas. We recommend the resultant subgrade be scarified, moisture conditioned and

recompacted in the presence of the engineer. Any instability or unsatisfactory soils detected during performance of this work will need to be addressed as recommended by the soils engineer.

We recommend new fill and backfill material consist of select cohesive soils having a plastic index between 12 and 25. Most overexcavated site soils free of topsoil, vegetation and fat clay soils will be acceptable for reuse as structural fill and backfill material. We recommend structural fill be placed in loose lifts of 8 inches or less in thickness, with each lift compacted to a minimum of 95 percent of the material's standard proctor maximum dry density (ASTM D698-91). Moisture content at the time of compaction should be controlled to between -3 and +3 percent of optimum (ASTM D-698).

We recommended backfill soils for utility trenches below footings and floor slabs be placed in 6 inch loose lifts with each lift compacted to a minimum of 95 percent of the material's standard Proctor maximum dry density (ASTM D698-91). Backfill in grassy areas should be compacted to a minimum of 90 percent of the material's standard Proctor maximum dry density (ASTM D 698-91). Due to the cohesive nature of the on site soils, granular fill and backfill which can provide an avenue for water reaching the bearing soils is not recommended within 10 feet of the structure.

We recommend a technician, working under the supervision of an experienced soils engineer, periodically monitor earthwork operations to evaluate compliance with the above recommendations.

Vertical cuts and excavations may stand for short periods of time, but should not be considered stable in any case. All excavations should be sloped back, shored, or shielded for protection of workers. Trenching and excavation activities should conform to federal and local regulations as a minimum. Based on the cohesive nature of the on site soils, this site will be suitable for trench footings.

The soils encountered in the soil borings classify as type B soils according to OSHA's Construction Standards for Excavations. In general, the maximum allowable slope for shallow excavations in a type B soil is 1H:1V.

FLOOR SLAB SUBGRADES

To provide uniform support for floor slabs, the subgrade should be reworked and compacted immediately prior to concrete placement. As a minimum, we recommend 12 inches of structural fill be provided below all floor slabs. We recommend fill below floor slabs be compacted to a minimum of 95 percent of the material's standard Proctor maximum dry density (ASTM D698-91). If a granular cushion is used beneath the floor slab, this layer should have a uniform thickness and be compacted by vibration prior to concrete placement.

We recommend concrete for floor slabs have a minimum cement content of 564 lb/yd^3 and a minimum compressive strength of 3500 psi. A 6 sack, sand and gravel mix placed at a water/cement ratio of 0.45 or less works well for light traffic floor slabs. An entrained air content of 3 to 5 percent is recommended for strength and workability. Non air entrained concrete is

recommended for power trolled or burnished floor slabs. This mix can also be used for exterior sidewalks by increasing the entrained air content to 5 to 8 percent.

SURFACE DRAINAGE AND LANDSCAPING

The success of the shallow foundation and slab-on-grade floor system is contingent upon keeping the subgrade soils at a relative constant moisture content and not allowing surface drainage an avenue to reach the bearing soils. Positive surface drainage away from the structure must be maintained at all times. Landscaped areas should be designed and built in such a way that irrigation and other surface water will be collected and carried away from foundation elements.

The final grade of the foundation backfill and any overlying pavement should have a positive slope away from foundation walls on all sides. A minimum slope of 1 inch per foot for the first 5 to 10 feet is recommended. However, the slope may be decreased if the ground surface next to foundations is covered with concrete slabs or asphalt pavements. A minimum slope of 2 percent is recommended for all other areas. Pavement and exterior slabs next to structures should be carefully sealed against moisture intrusion at the joints.

We recommend downspouts and faucets discharge onto splash blocks that slope away from foundation walls and extend a minimum of 3 feet from the building foundation.

GENERAL COMMENTS

The information and recommendations provided are based on a very preliminary design. Its possible additional borings and evaluation may be required once a specific design with elevations has been determined. The conclusions and recommendations contained in this report shall not be considered valid unless those changes are reviewed and the conclusions of this report either modified or verified in writing by the geotechnical engineer.

The analysis and recommendations submitted in this report are based in part upon the data obtained from five (5) soil borings. The nature and extent of variations of the on-site soils between borings may not become evident until construction. If variations appear, it will be necessary to re-evaluate the recommendations of this report.

It is recommended the geotechnical engineer be allowed to review the final design and specifications to verify compliance with respect to the recommendation of this study. It is also recommended the geotechnical engineer be retained to provide QA/QC testing services during the excavation, earthwork, and foundation construction phase of the project to verify site suitability and to provide recommendations if subsurface conditions differ from those expected.

Respectfully Prepared by:
Mid-State Engineering & Testing, Inc.

PROFESSIONAL CIVIL ENGINEER
JAMES MUSILEK
E-5935
STATE OF NEBRASKA

Jim Musilek, P.E.
Nebraska Reg. #E-5935

APPENDIX A
BORING LOCATION PLAN

Google earth

feet 300
meters 100

MID-STATE
ENGINEERING & TESTING, INC.
279 ROAD 'D', COLUMBUS, NE. 68601

BORING LOCATION PLAN
TWIN RIVER SCHOOL ADDITION
GENOA, NEBRASKA

APPENDIX B
BORING LOGS

MID-STATE ENGINEERING & TESTING, INC.

BORING LOG

PROJECT: Twin River
LOCATION: Genoa, Nebraska
JOB NO.: 200-83-20
DATE: 3/24

DRILL HOLE NO.	LOCATION OF DRILL HOLE	ELEVATION	DATUM	TOTAL DEPTH
DH-1	N 41 26' 57.82" W 97 44' 11.98"			15

WATER LEVEL OBSERVATIONS			TYPE OF SURFACE	DRILLER
WHILE DRILLING	END OF DRILLING	HOURS	Grass	Robert Reiling
			DRILLING METHOD	LOGGER
None	Encountered		4 1/4 Continuous Flight Auger	Tyler Dolezal

DEPTH FT.	SAMPLE NO. & TYPE	N" BLOWS / FT.	REC %	COLOR	MOIST	CONS.	SOIL TYPE (Class)	GEOLOGIC DESCRIPTION & OTHER REMARKS	MOIST %	DRY WEIGHT PCF	QU TSF	DEPTH FT.
								Grass 4" Roots				
	U-1			Dark Grey	Moist	Firm	CL	**COLLUVIAL DEPOSITS** w/ Carbon Stains, Rust	11.1	96.9		
	U-2			Lt Brown	Slightly Moist	Stiff	ML/CL	**PEORIAL LOESS DEPOSITS** w/ Calcum	8.9	89.3	1.1	
5	U-3											5
	U-4								11.3	91.0		
10												10
	U-5				Moist				16.7			
15												15
								Bottom of Hole 15.0'				
20												20
25												25
30												30
35												35

MID-STATE ENGINEERING & TESTING, INC.

BORING LOG

PROJECT	Twin River
LOCATION	Genoa, Nebraska
JOB NO.	200-83-20
DATE	3/24/2014

DRILL HOLE NO.	LOCATION OF DRILL HOLE	ELEVATION	DATUM	TOTAL DEPTH
DH-2	N 41 26' 57.90" W 97 44' 10.13"			15

WATER LEVEL OBSERVATIONS			TYPE OF SURFACE	DRILLER
WHILE DRILLING	END OF DRILLING	HOURS	Grass	Robert Reiling
			DRILLING METHOD	LOGGER
None	Encountered		4 1/4 Continuous Flight Auger	Tyler Dolezal

DEPTH FT.	SAMPLE NO. & TYPE	N" BLOWS / FT	REC %	COLOR	MOIST	CONS.	SOIL TYPE (Class)	GEOLOGIC DESCRIPTION & OTHER REMARKS	MOIST %	DRY WEIGHT PCF	QU TSF	DEPTH FT.
				Brown	Moist	Firm	CL	Grass 4" Roots				
	U-1			Light Brn	Moist	Stiff	CL	**COLLUVIAL DEPOSITS**	20.1	101.8		
				Light Red Brown	Moist	Stiff	CL	**LOVELAND LOESS DEPOSITS** w/ Calcium				
5	U-2								17.6	102.3	1.1	5
	U-3											
10									21.9			10
	U-4											
15									23.8	98.4		15
								Bottom of Hole 15.0'				
20												20
25												25
30												30
35												35

MID-STATE ENGINEERING & TESTING, INC.

BORING LOG

PROJECT	Twin River
LOCATION	Genoa, Nebraska
JOB NO.	200-83-20
DATE	3/24/2014

DRILL HOLE NO.	LOCATION OF DRILL HOLE	ELEVATION	DATUM	TOTAL DEPTH
DH-3	N 41 26' 57.1 W 97 44' 12.0"			10

WATER LEVEL OBSERVATIONS			TYPE OF SURFACE	DRILLER
WHILE DRILLING	END OF DRILLING	HOURS	Fill	Robert Reiling
None	Encountered		DRILLING METHOD: 4 1/4' Continuous Flight Auger	LOGGER: Tyler Dolezal

DEPTH FT.	SAMPLE NO. & TYPE	N° BLOWS / FT	REC %	COLOR	MOIST	CONS.	SOIL TYPE (Class)	GEOLOGIC DESCRIPTION & OTHER REMARKS	MOIST %	DRY WEIGHT PCF	QU TSF	DEPTH FT.
	U-1			Very Dark Grey	Moist	Firm	CL	**FILL w/ Gravel**	19.1	89.0		
	U-2								22.1	91.6		
	U-3			Dark Grey Brown	Moist	Stiff	CL	**SLOPE WASH DEPOSITS** w/ Carbon and Rust Stains	10.6	81.8	3.3	
5				Grey Brn	Slightly Moist							5
	U-4			Light Brn	Slightly Moist	Firm	ML/CL	**PEORIAN LOESS DEPOSITS** w/ Calcium Rust & Carbon Spots Root Hairs	9.7	89.3		
10												10
								Bottom of Hole 10.0'				
15												15
20												20
25												25
30												30
35												35

MID-STATE ENGINEERING & TESTING, INC.

BORING LOG

PROJECT: Twin River
LOCATION: Genoa, Nebraska
JOB NO.: 200-83-20
DATE: 3/24/2014

DRILL HOLE NO.	LOCATION OF DRILL HOLE	ELEVATION	DATUM	TOTAL DEPTH
DH-4	N 41 26' 57.12" W 97 44' 11.32"			10

WATER LEVEL OBSERVATIONS			TYPE OF SURFACE	DRILLER
WHILE DRILLING	END OF DRILLING	HOURS	Grass	Robert Reiling
None	Encountered		DRILLING METHOD: 4 1/4' Continuous Flight Auger	LOGGER: Tyler Dolezal

DEPTH FT.	SAMPLE NO. & TYPE	N" BLOWS / FT	REC %	COLOR	MOIST	CONS.	SOIL TYPE (Class)	GEOLOGIC DESCRIPTION & OTHER REMARKS	MOIST %	DRY WEIGHT PCF	QU TSF	DEPTH FT.
								Grass 4" Roots				
	U-1			Dark Grey Brown	Moist	Firm	CL	**FILL w/ Some Gravel**				
	U-2								21.0	97.9		
	U-3								16.5	96.1		
5												5
	U-4							Brick Pieces	16.5	91.1		
				Light Brn	Slightly Moist	Firm	CL	**PEORIAN** w/ Calcium Rust Spots				
10	U-5								15.7			10
								Bottom of Hole 10.0'				
15												15
20												20
25												25
30												30
35												35

MID-STATE ENGINEERING & TESTING, INC.

BORING LOG

PROJECT: Twin River
LOCATION: Genoa, Nebraska
JOB NO.: 200-83-20
DATE: 3/24/2014

DRILL HOLE NO.	LOCATION OF DRILL HOLE	ELEVATION	DATUM	TOTAL DEPTH
DH-5	N 41 26' 57.20" W 97 44' 10.10"			15.0'

WATER LEVEL OBSERVATIONS: WHILE DRILLING	END OF DRILLING	HOURS	TYPE OF SURFACE	DRILLER
			Grass	Robert Reiling
None	Encountered		DRILLING METHOD: 4 1/4 Continuous Flight Auger	LOGGER: Tyler Dolezal

DEPTH FT.	SAMPLE NO. & TYPE	N° BLOWS / FT.	REC %	COLOR	MOIST	CONS.	SOIL TYPE (Class)	GEOLOGIC DESCRIPTION & OTHER REMARKS	MOIST %	DRY WEIGHT PCF	QU TSF	DEPTH FT.
								Grass 4" Roots				
	U-1			Brown	Moist	Firm	CL/CH	**FILL w/ Gravel**				
	U-2			Brn/Light Brown				No Gravel	11.8	94.5		
	U-3								10.2	86.8		
5				Grey Brn	Slightly Moist	Firm	CL	**SLOPE WASH** w/ Rootholes, Root Hairs				5
	U-4								11.9	87.3	0.6	
				Light Brn	Slightly Moist	Firm	ML/CL	**PEORIAN LOESS** w/ Calicum Rust Stains				
10	U-5								13.6			10
								Rust				
	U-6			Light Grey								
15									20.5	91.3		15
								Bottom of Hole 15.0'				
20												20
25												25
30												30
35												35

APPENDIX C
SUMMARY OF SOILS TESTS

MID-STATE ENGINEERING & TESTING, INC.

SUMMARY OF SOILS TESTING

PROJECT	Twin River School
LOCATION	Geona, Nebraska
JOB NO.	200-83-20
DATE	3/26/2014

DRILL HOLE NO.	SAMPLE NO.	SAMPLE DEPTH (ft.)	WATER CONTENT %	DENSITY WET (pcf)	DENSITY DRY (pcf)	VOID RATIO (e)	SAT (%)	UNCONFINED COMPRESSION QU (tsf)	UNCONFINED COMPRESSION Strain (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	%PASS #200 SIEVE	CLASS.	SPT BLOW COUNTS	REMARKS
DH-1	U-1	1/2 - 2'														
	U-2	2 - 3 1/2'	11.1	107.6	96.9	0.739	41									
	U-3	3 1/2 - 5'	8.9	97.2	89.3	0.887	27	1.1	3.8							
	U-4	8 1/2 - 10'	11.3	101.3	91.0	0.851	36									
	U-5	13 1/2 - 15'	16.7													
DH-2	U-1	1/2 - 2'	20.1	122.3	101.8	0.655	83			44	18	26		CL		
	U-2	3 1/2 - 5'	17.6	120.3	102.3	0.647	74	1.1	1.7							
	U-3	8 1/2 - 10'	21.9													
	U-4	13 1/2 - 15'	23.8	121.8	98.4	0.712	90									
DH-3	U-1	1/2 - 2'	19.1	105.9	89.0	0.893	58									
	U-2	2 - 3 1/2'	22.1	111.9	91.6	0.839	71									
	U-3	3 1/2 - 5'	10.6	90.5	81.8	1.060	27	3.3	1.4							
	U-4	8 1/2 - 10'	9.7	98.0	89.3	0.887	30			31	22	9		CL/ML		Consolidation Test Sample
DH-4	U-1	1/2 - 2'														
	U-2	2 - 3 1/2'	20.8	118.2	92.9	0.721	78									
	U-3	3 1/2 - 5'	19.5	114.8	96.1	0.753	70									
	U-4	5 - 6 1/2'	16.5	106.1	91.1	0.849	53									
	U-5	8 1/2 - 10'	15.7													

MID-STATE ENGINEERING & TESTING, INC.

SUMMARY OF SOILS TESTING

PROJECT	Twin River School
LOCATION	Geona, Nebraska
JOB NO.	200-58-20
DATE	3/26/2014

DRILL HOLE NO.	SAMPLE NO.	SAMPLE DEPTH (ft.)	WATER CONTENT %	DENSITY WET (pcf)	DENSITY DRY (pcf)	VOID RATIO (e)	SAT (%)	UNCONFINED COMPRESSION QU (tsf)	UNCONFINED COMPRESSION Strain (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	%PASS #200 SIEVE	CLASS.	SPT BLOW COUNTS	REMARKS
DH-5	U-1	1/2 - 2'														
	U-2	2 - 3 1/2'	11.8	105.6	94.5	0.783	41			89	19	23		CL		
	U-3	3 1/2 - 5'	10.2	95.7	86.8	0.941	29									
	U-4	5 - 6 1/2'	11.9	97.7	87.3	0.930	35									
	U-5	8 1/2 - 10'	13.6													
	U-6	13 1/2 - 15'	20.5	110.0	91.3	0.845	65									

MID-STATE ENGINEERING & TESTING 11 EAST 11TH ST. KEARNEY, NE	Project: Twin River School	
	Location: Genoa, NE	
	Job No. 200-83-20	Date: 4/3/2014

CONSOLIDATION TEST

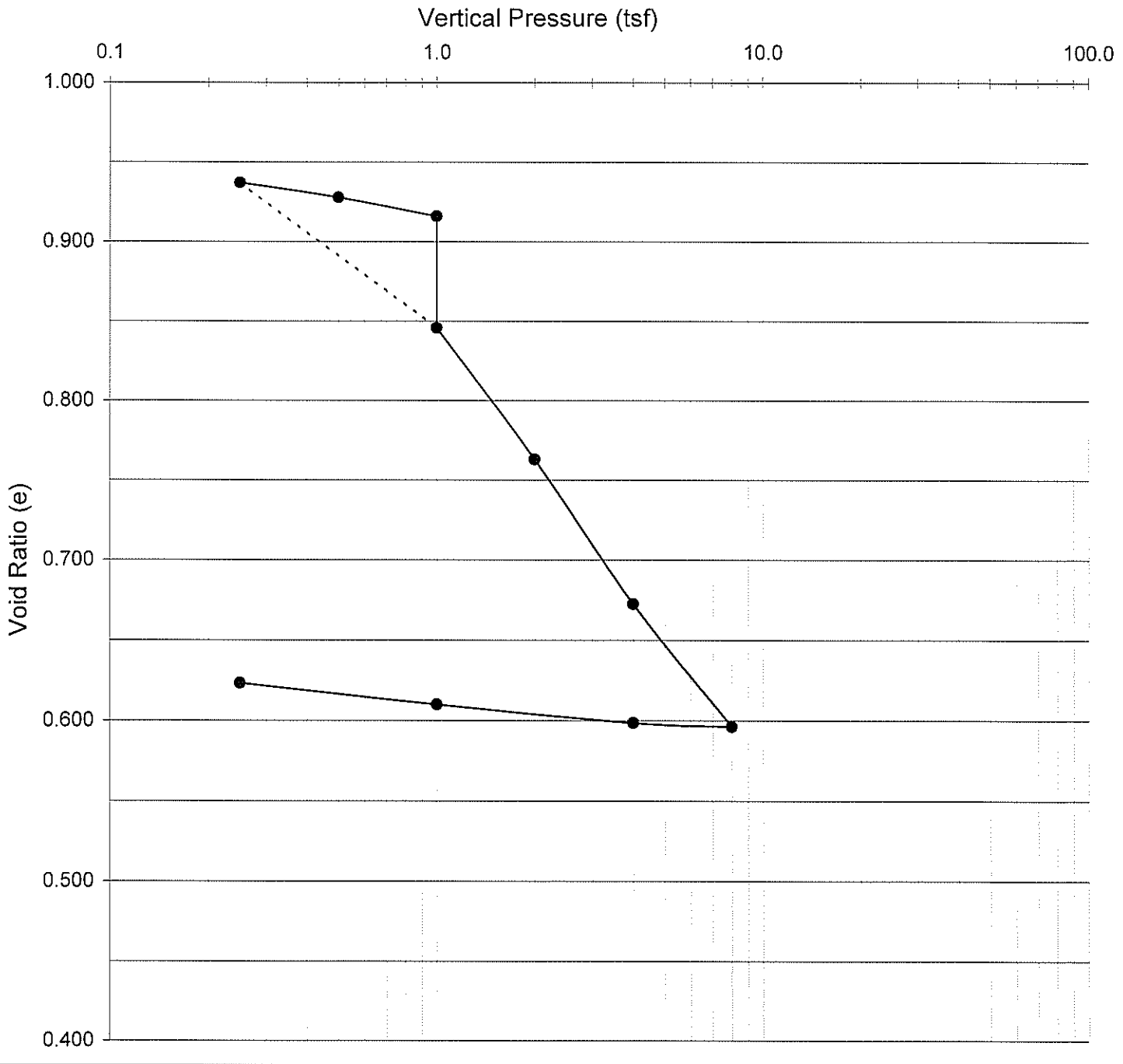
Drill Hole # DH-3 Sample # U-4 Sample Depth Interval 8 1/2 - 10

Sample Description brown lean clay

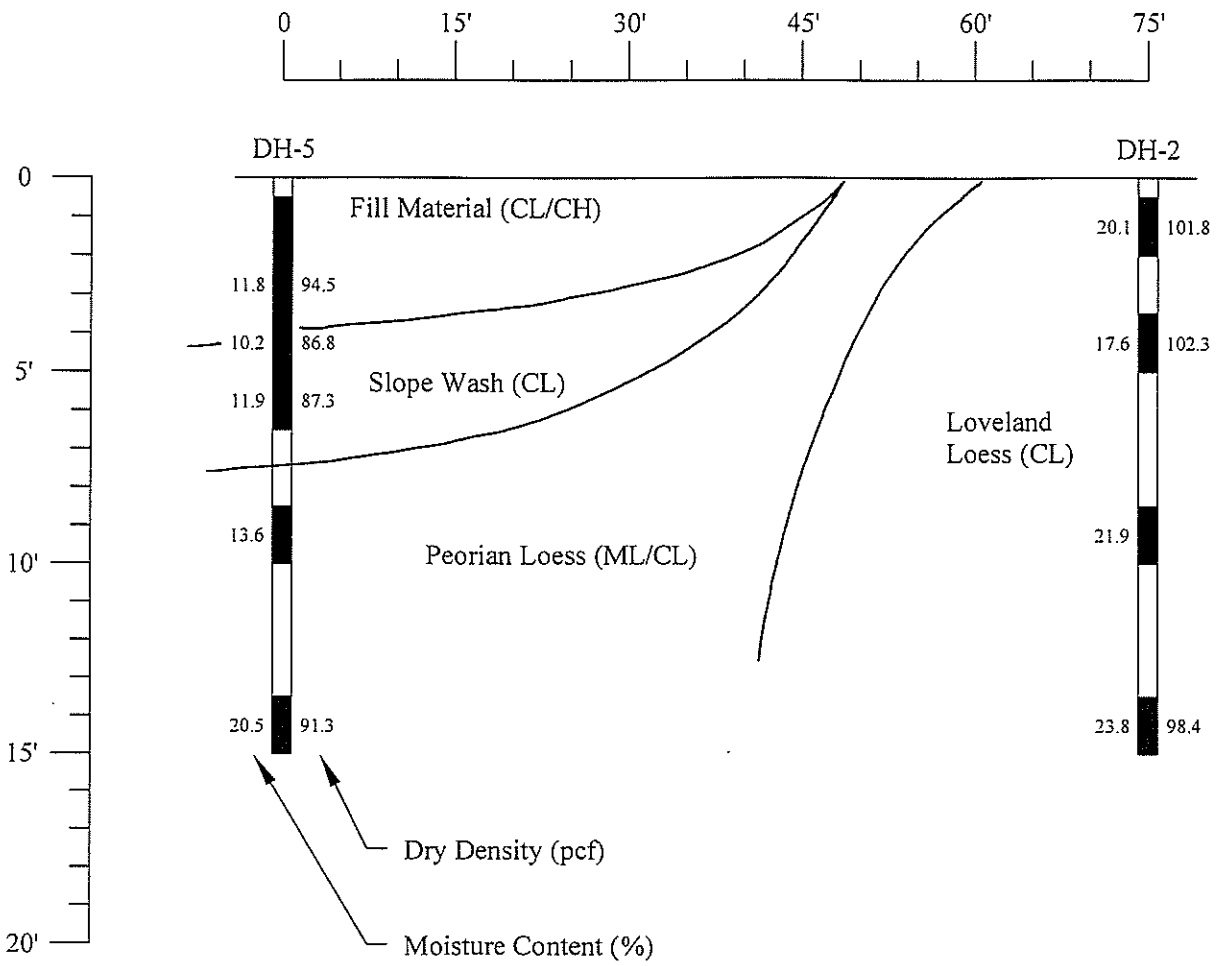
Initial Water Content (%) 9.7 Dry Unit Weight (pcf) 86.8 Initial Saturation (%) 27.8

Final Water Content (%) 24.0 Specific Gravity (Assumed) 2.70

Liquid Limit 31 Plastic Limit 22 Plasticity Index 9 Classification CL/ML



APPENDIX D
SOIL PROFILE



MID-STATE

ENGINEERING & TESTING, INC.

279 ROAD 'D', COLUMBUS, NE. 68601

SOIL PROFILE

TWIN RIVER SCHOOL

GENOA, NEBRASKA

MID-STATE

ENGINEERING & TESTING, INC.
279 ROAD 'D', COLUMBUS, NE. 68601

SOIL PROPERTIES

UNIFIED SOILS CLASSIFICATION

(Including Identification and Description)

Group Symbols	Typical Names	Values as Subgrade When No Subject to Frost Action	Potential Frost Action	Compressibility and Expansion	Drainage Characteristics	Compaction Equipment	Compacted Dry Unit Weight (pcf) ASTM-D-698	Typical Design Values	
								CBR	Subgrade Modulus k lb. per cu. in.
GW	Well-graded gravels, gravel-Sand mixture, little or no fines	Excellent	None to Very Slight	Almost None	Excellent	Crawler-type tractor, rubber tired roller, steel-wheeled roller	125-140	40-80	300-500
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Good to Excellent	None to Very Slight	Almost None	Excellent	Crawler-type tractor, rubber tired roller, steel-wheeled roller	110-140	30-60	300-500
GM	Silty gravels, gravel-sand-silt mixtures, <50% Silts & Clays	Good to Excellent	Slight to Medium	Slight	Fair to Poor	Rubber-tired roller Sheepfoot roller	115-135	20-60	200-500
GC	Clayey gravels, gravel-sand-clay mixtures, <50% Silts & Clays	Good	Slight to Medium	Slight	Poor to Practically Impervious	Rubber-tired roller Sheepfoot roller	130-145	20-40	200-500
SW	Well-graded sands, gravely sands, little or no fines	Good	None to Very Slight	Almost None	Excellent	Crawler-type tractor rubber-tired roller	110-130	20-40	200-400
SP	Poorly-graded sands, gravely sands, little or no fines	Fair to Good	None to Very Slight	Almost None	Excellent	Crawler-type tractor rubber-tired roller	105-135	10-40	150-400
SM	Silty sands, sand-silt mixtures <50% Silts & Clays	Fair to Good	Slight to High	Slight	Fair to Poor	Rubber-tired roller Sheepfoot roller	120-135	15-40	150-400
SC	Clayey sands, sand-clay mixtures <50% Silts & Clays	Poor to Fair	Slight to High	Slight to Medium	Poor to Practically Impervious	Rubber-tired roller Sheepfoot roller	100-135	5-20	100-300
ML	Inorganic silts and very fine sands rock flour, silty fine sands or clayey silts with slight plasticity	Poor to Fair	Medium to Very High	Slight to Medium	Fair to Poor	Rubber-tired roller Sheepfoot roller, close control of moisture	100-120	15 or Less	100-200
CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays	Poor to Fair	Medium to High	Medium	Practically Impervious	Rubber-tired roller Sheepfoot roller	90-130	15 or Less	50-150
OL	Organic silts and organic silty clays of low plasticity	Poor	Medium to High	Medium to High	Poor	Rubber-tired roller Sheepfoot roller	90-105	5 or Less	50-100
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	Poor	Medium to Very High	High	Fair to Poor	Sheepfoot roller Rubber-tired rolfer	90-105	10 or Less	50-100
CH	Inorganic clays or high plasticity fat clays	Poor to Fair	High	High	Practically Impervious	Sheepfoot roller Rubber-tired roller	90-115	15 or Less	50-150
OH	Organic clays of medium to high plasticity, organic silts	Poor to Very Poor	High	High	Practically Impervious	Sheepfoot roller Rubber-tired roller	80-110	5 or Less	25-100
Pt	Peat and other highly organic soils	Not Suitable	Very High	Very High	Fair to Poor	Compaction Not Practical			