GEOTECHNICAL ENGINEERING REPORT
LINN RESIDENCE
ISLAND CLUB SOUTH ROAD
MT. PLEASANT, WISCONSIN

KTE / Terracon Project No. 59035099
August 15, 2003

Prepared for:

Mr. and Mrs. George and Elaine Linn
Mt. Pleasant, Wisconsin

Prepared by:

KTE / Terracon
Kenosha, Wisconsin

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August 15, 2003

Mr. and Mrs. George and Elaine Linn
1110 Prairie Drive – Unit 42
Racine, Wisconsin 53406

Re: Geotechnical Engineering Report
Linn Residence
Island Club South Road
Mt. Pleasant, Wisconsin
KTE / Terracon Project No. 59035099

Mr. and Mrs. Linn:

We are submitting, herewith, the results of our subsurface exploration for the referenced project. The purpose of this exploration was to obtain information on subsurface conditions at the proposed project site and, based on this information, to provide recommendations regarding the design and construction of foundations and floor slabs for the proposed residential structure.

In summary, groundwater was encountered at depths about 5 feet below current grade in the piezometers set in borings.. The basement level should be established above the groundwater levels to reduce the potential for seepage into below grade spaces. Footing foundations bearing on approved native soils or on new engineered fill extending down to suitable native soils are considered feasible for support of the proposed structure. Our recommendations for foundation and floor slab design, as well as comments related to construction of these elements at the project site are included in this report.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service to you in any way, please contact us.

Sincerely,
KTE / TERRACON

Robert L. Allbright, E.I.T.
Project Engineer

Brett E. Bradfield, P.E.
Sr. Project Engineer

Copies to: Addressee (3)

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INTRODUCTION

A subsurface exploration has been completed for the proposed residential structure planned to be located on Island Club South Road in Mt. Pleasant, Wisconsin, at the two empty lots adjacent to 3300 Island Club South Road. Four (4) soil borings extending to a depth of about 20 feet below the existing ground surface were drilled on the project site. Individual boring logs and a location diagram are included with this report. The purposes of this report are to describe the subsurface conditions encountered in the borings, present the test data, and provide recommendations regarding the design and construction of foundations and floor slabs for the proposed structure.

PROJECT DESCRIPTION

We understand that the proposed project will consist of a one-story residential structure located within the two adjacent lots where the exploration was performed. The exact location of the structure has not been determined. Construction is anticipated to consist of a wood frame house. We anticipate wall loads will be less than 2 kips per lineal foot and column loads will be less than 30 kips. We anticipate that excavations for the basement level would extend less than 8 feet below current grade.

For the purposes of this report, we have assumed maximum cut and fill depths of less than about 4 feet will be necessary to develop the final subgrade level in the non-basement areas of the proposed building.

SITE EXPLORATION PROCEDURES

Field Exploration

The borings were placed in the approximate vicinities of two potential building footprints. Distances from these locations to the reference features shown on the attached diagram are approximate and were measured with a rolling wheel measuring device. Right angles for the boring location measurements were estimated. The drill crew obtained the elevations at the boring locations using a surveyor's rod and level. The elevations were

referenced to the top flange bolt of the fire hydrant located at the east end of the proposed building site. For the purposes of this report, we assigned this benchmark an elevation of 100.0 feet, KTE / Terracon site datum. The elevations, rounded to the nearest 1/2 foot, are presented on the boring logs. Locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with a truck-mounted drilling rig, using continuous flight augers to advance the boreholes. Representative samples were obtained using the split-barrel sampling procedure in general accordance with ASTM procedures. In the split-barrel sampling procedure, a standard 2-inch O.D. split-barrel sampling spoon is driven into the ground with a 140 pound hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the standard penetration resistance value. These values are indicated on the boring logs at the depths of occurrence. The samples were sealed and returned to the laboratory for testing and classification.

Standpipe piezometers were installed in Borings 2 and 3, which were closest to the pond, to monitor groundwater levels. The piezometers were constructed with 10 feet of screened pipe at the bottom of the well, connected to solid PVC piping that extended up to the ground surface. The piezometers were backfilled with filter sand around the screen area, followed by bentonite plug to the ground surface.

The drill crew prepared a field log of each boring. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

Laboratory Testing

Soil samples were tested in the laboratory to measure their natural water contents. A hand penetrometer was used to estimate the approximate unconfined compressive strength of the native cohesive soil samples. The test results are provided on the boring logs.

As part of the testing program, the samples were examined in the laboratory and classified in accordance with the attached General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated

group symbols for the Unified Soil Classification System are shown on the boring logs, and a brief description of the Unified System is included with this report.

SITE AND SUBSURFACE CONDITIONS

Site Description

The project site is located on Island Club South Road in Mt. Pleasant, Wisconsin, at the two empty lots adjacent to 3300 Island Club South Road. The lots were bordered by an existing home to the east and the shoreline of a pond to the north. The ground surface was covered by grass and weed vegetation. The topography of the lot was relatively flat, with a slight downward slope from south to north, towards the pond. The ground surface elevations at the boring locations were about 97.5 to 99.5 feet and the water level of the pond was about 95 feet (site datum).

Soil Conditions

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Based on the results of the borings, subsurface conditions at the boring locations can be generalized as follows.

About 4 to 10 inches of topsoil was encountered from the surface of the borings. Lean clay fill materials were encountered beneath the topsoil and continued to depths of about 3.5 to 6 feet in Borings 1 and 4. The fill contained amounts of crushed red brick and wood chip materials. Below the fill, gray very stiff to stiff consistency lean clay soils extended to about 18.5 feet. The borings encountered hard, gray silty clay soils below the lean clay to their termination depths of about 20 feet.

Fill material was not encountered in Borings 2 and 3. These borings were located on the northern side of the lots, near the pond. Medium stiff to stiff consistency, gray lean clay was encountered beneath the topsoil to depths of about 18.5 feet at these borings. A layer of soft consistency lean clay was encountered between about 6 to 8.5 feet in Boring 2. The borings encountered very stiff to hard, gray silty clay soils below the lean clay to their termination depths of about 20 feet.

Please refer to the attached boring logs for the laboratory data and a more detailed description of the subsurface conditions encountered at the individual boring locations.

Groundwater Conditions

The borings were observed for groundwater during drilling and immediately after drilling. These water levels are presented on the boring logs. Groundwater was observed in Borings 2, 3 and 4 during drilling, at depths ranging from about 7 to 15 feet. The water levels were checked immediately after drilling and the depth to water ranged between about 12 and 15 feet. The water level in Boring 4 was observed one (1) hour after drilling and the water level was at a depth of about 5 feet below the ground surface.

Standpipe piezometers were installed in Borings 2 and 3 in order to allow for longer term water level measurements. The water levels observed within these piezometers a few days after completing the borings ranged from about 4 to 5.5 feet (elevations 92 to 94.5 feet). The elevation of the water at the pond surface during the time of the borings was about 95 feet Terracon Site Datum. The water levels measured in the piezometers correlate to about the elevation of the water in the pond.

Fluctuation of groundwater levels could occur due to seasonal variations in the water level in the adjacent pond, amount of rainfall, runoff and other factors not evident at the time the borings were performed. Also, trapped or "perched" water could be present within pervious fill materials or in more permeable sand or silt seams or layers. Therefore, groundwater levels during construction or at other times after occupying the residence may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

ENGINEERING ANALYSIS AND RECOMMENDATIONS

Geotechnical Considerations

Relatively shallow groundwater was encountered in the borings and piezometers. The depth to water was near the pond level at the time of the exploration. Raising of site grades should be considered in order to bring the basement level above the measured depth to water. If this is not possible, continuous flow of water into sump pits should be anticipated.

About 3.5 to 6 feet of fill materials were encountered in the borings and low strength clays were encountered in Borings 1, 2 and 3. Based on the results of the standard penetration tests in the fill, we do not recommend support of footings on or above the fill materials. We recommend that the excavation for footings in the basement area extend through these materials into native lean clay soils in most areas. Deepened excavations should be

anticipated in areas where soft clay soils are encountered. For non-basement portions of the structure, we recommend foundations be extended through the fill to bear on suitable native soils as well. In our opinion, footing foundations that bear on suitable native soils or on new engineered fill, which extends down to suitable native soil and is compacted as recommended in this report, would provide for suitable support of the structure.

Based on the existing grades, the floor slabs that are cast near existing grades would be supported over the existing fill. Due to the relatively light floor loads anticipated, supporting the floor slab over stable portions of the existing fill is considered possible. While there is some risk to the owner of adverse floor slab performance, the risk could be reduced by observing and testing the subgrade soils for soft, loose or otherwise unsuitable areas. Even with thorough observation and testing, it is possible that voids or unsuitable material could be present within or buried by the fill and will not be detected. The risk of adverse slab performance could be further reduced by partially excavating the existing fill and providing a zone of compacted fill beneath the floor slabs.

Our recommendations regarding design and construction of foundations and floor slabs for the proposed structure are contained in the following subsections.

Site Preparation

The surface of the proposed construction areas should be stripped of vegetation and any loose, soft or otherwise unsuitable material. Actual stripping depths will likely vary and we recommend that a KTE / Terracon representative assist in evaluating that unsuitable materials are removed at the time of construction.

We recommend a representative of KTE / Terracon observe and test the subgrade conditions after excavating to rough grade in the basement and non-basement areas. Unstable areas observed at this time should be improved by scarification and recompaction or by undercutting and replacement with suitable compacted fill. If old fill is encountered in the basement area excavation, the excavation should be continued deeper.

Fill placed in the building area should be low plasticity cohesive soil or granular soil. Fill placed in confined excavations and footing overexcavations, should consist of relatively clean and well-graded granular material. This should provide for greater ease of placement and compaction in confined areas where larger compaction equipment cannot be operated.

Fill placed should consist of approved materials that are free of organic matter and debris. If earthwork is performed during cold weather, we recommend the fill not contain frozen material and that it not be placed on a frozen subgrade. Low plasticity cohesive soil would have a liquid limit less than 45 and a plasticity index less than 20. Some moisture conditioning (generally drying) of the on-site soils will likely be necessary to facilitate compaction. Laboratory compaction tests should be performed on all potential fill materials. Further evaluation of any on-site soils or off-site fill materials should be performed by KTE / Terracon prior to their use in compacted fill sections.

We recommend fill placed above footing base elevation for support of lightly loaded floor slabs be compacted to at least 95 percent of the material's maximum dry density as determined by ASTM D-698 (Standard Proctor). Fill placed below footing base elevation in the building area should be compacted to at least 98 percent of the material's maximum dry density. The higher degree of fill compaction below footings in the building area should also extend laterally in all directions beyond the edges of the footings at least 8 inches per foot of fill thickness below footing base elevation. We recommend all new fill placement and compaction be observed and tested by KTE / Terracon personnel.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and to reduce construction traffic over the prepared subgrade. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

Site grades around the building area should be maintained so surface water will flow away from construction areas. During earthwork operations, all exposed subgrades should be properly sloped to provide rapid drainage so that softening of the subgrades can be reduced. Surface water accumulated in the building area should be removed as soon as possible to avoid wetting or disturbance of the subgrade soils.

Seepage of water into open excavations that extend near or below the water table should be expected. Necessary steps should be taken to control water accumulation within open excavations to maintain a workable surface. These steps can consist of simple sump pits and pumps or nearby well points to draw the water level to a minimum of 2 feet below the excavation bottom.

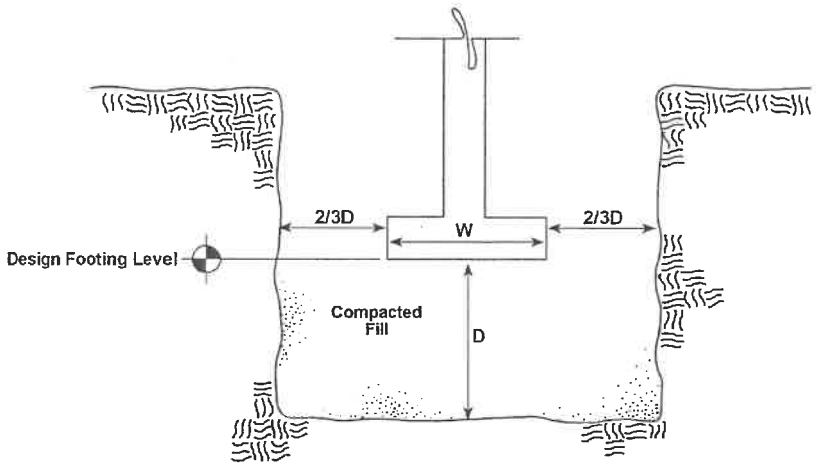
Footing Foundations

Suitable foundation bearing soils would consist of native stiff to very stiff lean clay or new compacted fill that extends to suitable native soils. Footing foundations that bear on suitable soils could be designed using a maximum net allowable soil bearing pressure of 2000 psf. The net allowable soil bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at footing base elevation.

Where existing fill or otherwise unsuitable materials are present at the base of foundation excavations, it will be necessary to extend excavations deeper to reach suitable bearing soils. The excavations could be deepened and the footings lowered to this level or an overexcavation and granular backfill procedure could be performed. For the overexcavation and granular backfill option, we recommend the excavation extend laterally at least 8 inches beyond all edges of the footing for each 12 inches of additional excavation required below foundation design elevation. The overexcavation should then be backfilled to design elevation with granular materials that are approved by the geotechnical engineer. The granular fill should be placed in lifts having a maximum loose thickness of 9 inches and should be compacted to at least 98 percent of the material's maximum dry density (ASTM D-698). A diagram illustrating the overexcavation and backfill procedure is presented below. For the recommended bearing pressure, we anticipate deepened foundation excavations that are backfilled with stone, would not need to extend more than 2 feet below the design elevation.

Perimeter footings and footings beneath unheated areas should extend at least 4 feet below the lowest adjacent finished grade for frost protection. Isolated footings should have a minimum width of 30 inches, and continuous formed footings should have a minimum width of 18 inches.

Due to the presence of fill materials and the potential for subsurface variations across the site, it is important and recommended that KTE / Terracon personnel evaluate the soil conditions at and below footing grade at the time the excavations are performed. We further recommend that in-place density testing (in areas where foundations bear on new engineered fill) and sampling of the soils at and below footing level be performed by KTE / Terracon to evaluate that the bearing soils properties are consistent with the recommended design parameters.

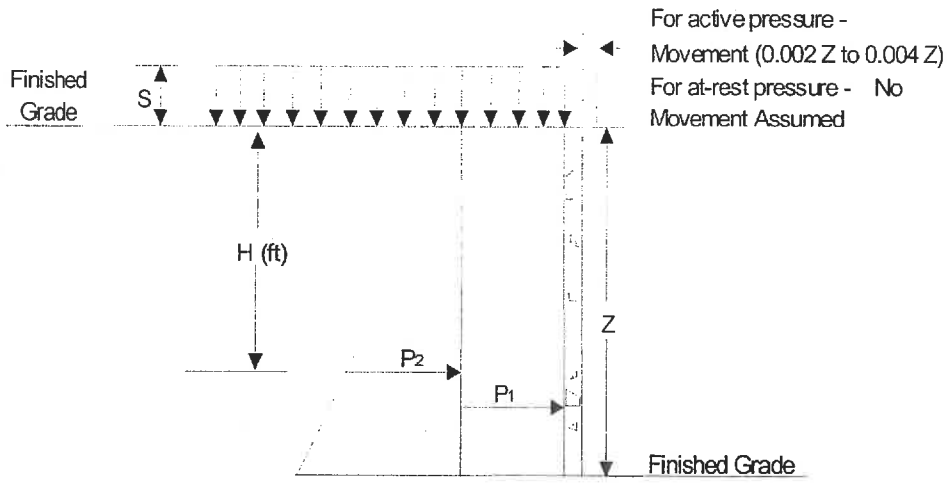


Note: Excavation sides are shown vertical for reference only; slopes should conform to OSHA requirements.

Based on the subsurface conditions, our understanding of the project and structural information described herein, we estimate that maximum post-construction settlements of the footing foundations designed and constructed in accordance with the recommendations in this report would be on the order of 1 inch. Differential settlements will depend upon actual soil conditions, foundation loads and the quality of earthwork and foundation construction, but can typically be on the order of 1/2 to 2/3 the total settlement.

Lateral Earth Pressures and Subsurface Drainage

Basement walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall rotation, and would be appropriate for the basement walls proposed. The recommended design lateral earth pressures are for **cast-in-place concrete walls only** and do not include a factor of safety or any provision for possible hydrostatic pressure on the walls.



EARTH PRESSURE COEFFICIENTS

EARTH PRESSURE CONDITIONS	COEFFICIENT FOR BACKFILL TYPE	EQUIVALENT FLUID PRESSURE (pcf)	SURCHARGE PRESSURE, P_1 (psf)	EARTH PRESSURE, P_2 (psf)
Active (Ka)	Granular - 0.33	40	(0.33)S	(40)H
	Lean Clay - 0.42	50	(0.42)S	(50)H
At-Rest (Ko)	Granular - 0.46	55	(0.46)S	(55)H
	Lean Clay - 0.58	70	(0.58)S	(70)H
Passive (Kp)	Granular - 3.0	360	---	---
	Lean Clay - 2.4	290	---	---

Conditions applicable to the above conditions include:

- For active earth pressure, wall must rotate about base, with top lateral movements 0.002 Z to 0.004 Z, where Z is wall height
- For passive earth pressure, wall must move horizontally to mobilize resistance.
- Uniform surcharge, where S is surcharge pressure
- In-situ soil backfill weight a maximum of 120 pcf
- Horizontal backfill, compacted to at least 93% of standard Proctor maximum dry density
- Loading from heavy compaction equipment not included
- No groundwater acting on wall

- No safety factor included
- Ignore passive pressure in frost zone

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, a value of 0.30 should be used as the allowable coefficient of friction between the footing and the underlying soil.

Heavy construction equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures greater than those provided. Backfill placed in non-structural areas adjacent to the walls should be placed in thin lifts and compacted using hand-operated equipment to at least 93 percent, but no more than 98 percent, of the material's maximum standard Proctor dry density (ASTM D-698). Exterior grading should be performed to provide surface water flow away from the structure.

To control the water level behind the wall and reduce the potential for seepage into the lower levels, we recommend a perimeter drain be installed at the foundation level. The perimeter drain could consist of perforated, rigid plastic or metal drain lines installed outside the base of the below grade walls. The invert of a drain line around the perimeter of below-grade structures should be at least 12 inches below the finished subgrade elevation of the interior slab or at least at footing base level. The drain line should be sloped to provide positive gravity drainage to sump or other gravity discharge point, and should be surrounded by free-draining (less than 3 percent fines) granular material graded to prevent the intrusion of fines, or an alternative non-graded free-draining granular material encapsulated with suitable filter fabric. At least a 2-foot wide section of free-draining granular fill should be used for backfill above the drain line and adjacent to the wall. The drainage section should extend to within 2 feet of final grade. The drainage section should be capped with low-permeability compacted cohesive fill to minimize infiltration of surface water into the drain system.

Based on the results of the borings, it appears that basement excavations could encounter water bearing soils if site grades are not raised. Therefore, in addition to the perimeter drain recommended above, an underslab drain system should be installed below the basement floor slab to collect drainage and discharge water to reduce uplift forces. Emergency back-up power should also be planned for sump systems.

An underfloor drain system would consist of placing at least a 6-inch thickness of free-draining granular material on the subgrade below the slab. Minimum 4-inch diameter

slotted drain lines should be trenched in at least 12 inches below the base of the slab and surrounded with free draining granular material, hydraulically connecting the drainage trenches to the granular drainage blanket. A geotextile fabric should be placed on the soil subgrade and in the base of the drain trenches to reduce the potential for clogging the drain lines by intrusion of fines. These lateral drains should be placed at 20 feet on-center, and should be sloped to an appropriate point for gravity discharge or to a sump pit and pump.

Floor Slab Support

The recommendations presented in the **Geotechnical Considerations and Site Preparation** subsections of this report are intended to develop a subgrade suitable for support of floor slabs. In these sections, the need for further evaluation of the existing fill, site preparation, and compaction of fill was discussed.

We recommend at least 4 inches of a well-graded, granular material such as Wisconsin Department of Transportation (WDOT) 304.2.6 Gradation No.2, be used immediately below non-basement floor slabs. This granular material will serve as a leveling course and capillary moisture break. The granular base should be placed on a stable subgrade and compacted to at least 95 percent of the material's standard Proctor maximum dry density (ASTM D-698).

Floor slabs should be isolated from the foundation walls and columns. Also, it is especially important that backfill on the interior side of foundation walls be carefully placed and compacted per the recommendations provided herein. This will help to provide uniform slab support and reduce the potential for settlements that can cause cracking near the foundations. Slabs should also have adequate reinforcement and proper jointing to reduce possible distress due to slight differential movements.

Site Classification for Use in Seismic Load Analysis

According to the 2002 Wisconsin Enrolled Commercial Building Code Section 1615.1.5.1 and based on the subsurface soil conditions observed during our soil exploration, it is our opinion that the site should be considered as a Site Class "D" for a stiff soil.

Construction Considerations

Impervious surfaces or finished grading slopes of at least 2 percent should be maintained for a distance of 5 feet or more outside the building perimeters to direct surface water away from the structure. Roof drains should extend so as not to discharge in lawn areas within 10 feet of the building.

For the assumed depth of basement, it appears that sufficient space exists on site to perform an open-cut excavation. All excavations should comply with the requirements of OSHA 29CFR, Part 1926, Subpart P, "Excavations" and its appendices, as well as other applicable codes. This document states that the excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the job specifications. Slope heights, slope inclinations and/or excavation depths should in no case exceed those specified in local, state or federal safety regulations, including current OHSA excavation and trench safety standards.

GENERAL COMMENTS

KTE / Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. KTE / Terracon also should be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

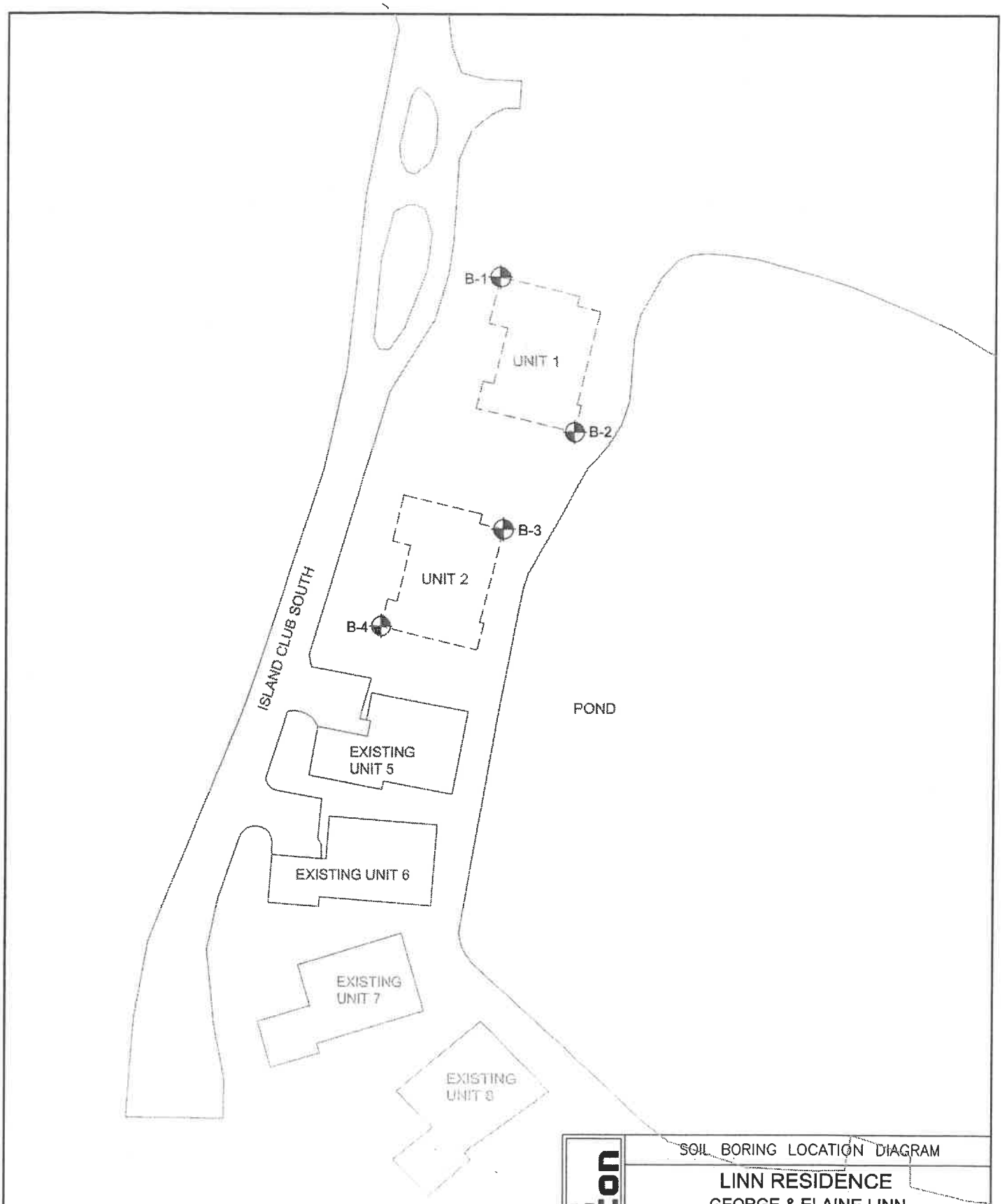
Support of floor slabs over some thickness of existing fill is discussed in this report. However, even with the recommended construction testing, there is a risk that unsuitable material within or buried by the fill will not be discovered. This risk cannot be eliminated without removing the fill, but in our opinion, can be reduced to a reasonable level by thorough exploration and testing.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless KTE / Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

SOIL BORING LOCATION DIAGRAM
SOIL BORING LOGS



N

LEGEND

- Approximate Boring Location

NOTE: DRAWING IS INTENDED FOR GENERAL LOCATION PURPOSES ONLY.

KTE TerraCon

SOIL BORING LOCATION DIAGRAM

LINN RESIDENCE

GEORGE & ELAINE LINN

ISLAND CLUB SOUTH & LEONA LANE

MT. PLEASANT, WI

APPROXIMATE DRAWING SCALE 0 60'

PROJECT #	FILE NAME	DATE	BY
59035099	5099SBLD	08/07/03	TJP

LOG OF BORING NO. 1

CLIENT George and Elaine Linn

SITE Island Club South Road
Mt. Pleasant, Wisconsin

PROJECT Linn Residence

Approx. Surface Elev.: 99.5 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	4" TOPSOIL				AS					
	FILL: SANDY LEAN CLAY AND GRAVEL WITH CRUSHED RED BRICK, gray			1	SS		14	14		
					PA					
	3.5 96									
	LEAN CLAY, TRACE SAND AND GRAVEL, gray, very stiff to stiff		CL	2	SS		8	14		6500*
		5			PA					
			CL	3	SS		5	24		2000*
					PA					
	8.5 91									
	LEAN CLAY, TRACE SAND, GRAVEL AND ORGANICS, gray, very stiff to hard		CL	4	SS		12	14		8500*
		10			PA					
			CL	5	SS		26	14		9000*
		15			PA					
	19 80.5									
	20 **SILTY CLAY, TRACE SAND AND GRAVEL**, gray, hard 79.5		CL-ML	6	SS		28	18		9000*
	BOTTOM OF BORING	20								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

**140 Lbs Automatic SPT Hammer
*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft

WL	▽ NONE	WD	▼ NONE	AB
WL	▽		▼	
WL				

Terracon

BORING STARTED	8-4-03		
BORING COMPLETED	8-4-03		
RIG	CME-45	FOREMAN	TC
APPROVED	RLA	JOB #	59035099

BOREHOLE 59035099.GPJ TERRACON.GDT 8/14/03

LOG OF BORING NO. 2

CLIENT: George and Elaine Linn

SITE: Island Club South Road, Mt. Pleasant, Wisconsin

PROJECT: Linn Residence

Approx. Surface Elev.: 98.5 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	DESCRIPTION
			AS						**4" TOPSOIL**
	CL	1	SS		9	15		6000*	**LEAN CLAY, TRACE SAND, GRAVEL AND ORGANICS**, brown, very stiff
			PA						
3.5									95
	CL	2	SS		10	16		2000*	**SANDY LEAN CLAY, TRACE GRAVEL** ▼ gray, soft to stiff
5			PA						
	CL	3	SS		3	19		1000*	
			PA						
	CL	4	SS		6	12		2500*	
10			PA						
13.5									85
	CL	5	SS		23	14		9000*	**LEAN CLAY, TRACE SAND AND GRAVEL**, gray, hard ▼ ▽
15			PA						
18.5									80
	CL-ML	6	SS		30	20			**SILTY CLAY, TRACE SAND AND GRAVEL**, gray, very stiff
20									78.5
20									BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

**140 Lbs Automatic SPT Hammer
*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 18	WD	▼ 15	AB
WL	▼ 4	8/7/03	▼	
WL				

Terracon

BORING STARTED	8-4-03
BORING COMPLETED	8-4-03
RIG CME-45	FOREMAN TC
APPROVED RLA	JOB # 59035099

BOREHOLE 59035099.GPJ TERRACON.GDT 8/14/03

LOG OF BORING NO. 3

CLIENT George and Elaine Linn

SITE Island Club South Road
Mt. Pleasant, Wisconsin

PROJECT Linn Residence

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	Approx. Surface Elev.: 97.5 ft									
	5" TOPSOIL				AS					
	LEAN CLAY WITH SAND, TRACE GRAVEL AND ORGANICS, gray, very stiff		CL	1	SS		7	10		7500*
					PA					
			CL	2	SS		5	21		2500*
		5			PA					
	6 91.5									
	SANDY LEAN CLAY, TRACE GRAVEL, gray, medium stiff		CL	3	SS		2	13		2000*
					PA					
	10 87.5		CL	4	SS		3	21		
	LEAN CLAY, TRACE SAND AND GRAVEL, gray, hard	10			PA					
			CL	5	SS		44	13		9000*
		15			PA					
	18.5 79									
	SILTY CLAY, TRACE SAND AND GRAVEL, gray, hard		CL-ML	6	SS		43	21		
	20 77.5	20								
	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

**140 Lbs Automatic SPT Hammer
*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 7	WD	▼ 15	AB
WL	▼ 5.5	8/7/03	▼	
WL				

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BORING STARTED	8-1-03		
BORING COMPLETED	8-1-03		
RIG	CME-45	FOREMAN	TC
APPROVED	RLA	JOB #	59035099

BOREHOLE 59035099.GPJ TERRACON.GDT 8/14/03

LOG OF BORING NO. 4

CLIENT: George and Elaine Linn

SITE: Island Club South Road, Mt. Pleasant, Wisconsin

PROJECT: Linn Residence

Approx. Surface Elev.: 99.5 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N ** BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	DESCRIPTION
			AS						**10" TOPSOIL**
		1	SS		17	14			**FILL: LEAN CLAY WITH SAND, TRACE GRAVEL**, gray
3.5			PA						96
		2	SS		3	10			**FILL: LEAN CLAY WITH SAND, TRACE GRAVEL AND WOOD CHIPS**, brown ▼
6			PA						93.5
5	CL	3	SS		8	16		6000*	**LEAN CLAY, TRACE SAND, GRAVEL AND ORGANICS**, gray, very stiff
			PA						
	CL	4	SS		8	17		5500*	
10									▽ 89.5
			PA						**LEAN CLAY, TRACE SAND AND GRAVEL**, gray, very stiff ▼
	CL	5	SS		19	15			
15			PA						
18.5									81
	CL-ML	6	SS		79	18			**SILTY CLAY, TRACE SAND AND GRAVEL**, gray, hard
20									79.5
									BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

**140 Lbs Automatic SPT Hammer
*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 10	WD	▼ 12	AB
WL	▼ 5	1 hr	▼	
WL				

Terracon

BORING STARTED	8-1-03		
BORING COMPLETED	8-1-03		
RIG	CME-45	FOREMAN	TC
APPROVED	RLA	JOB #	59035099

BOREHOLE 59035099.GPJ TERRACON.GDT 8/14/03

APPENDIX B

GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". For 3" O.D. ring samplers (RS) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as "blows per foot," and is not considered equivalent to the "Standard Penetration"or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 3	0-6	Very Loose
4 – 9	7-18	Loose
10 – 29	19-58	Medium Dense
30 – 49	59-98	Dense
50+	99+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

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UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$		GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3^E$		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$		SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3^E$		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay[K,L,M]
			PI lots below "A" line		MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

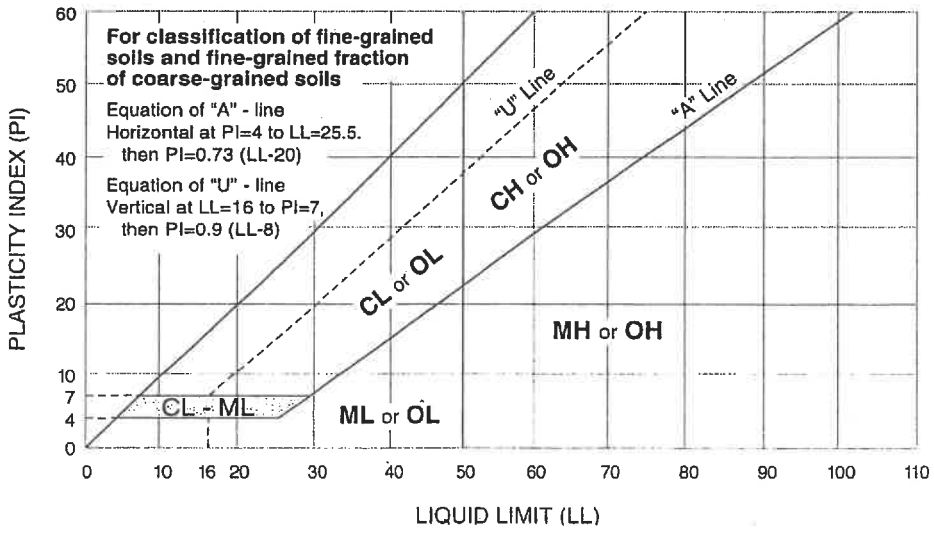
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



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