State of Utah

GARY R. HERBERT
Governor

Department of Administrative Services
KIMBERLY K. HOOD
Executive Director

Division of Facilities Construction and Management
DAVID G. BUXTON
Director

ADDENDUM NO. 1

Date:	August 31, 2009
To:	Contractors
From:	Wayne Smith – Project Manager
Reference:	Price Armory Upgrade Utah National Guard – Price, Utah DFCM Project No. 08297480
Subject:	**Addendum No. 1**

Pages	Addendum Cover Sheet	1	page
	Architect's Addendum No. 1	31	pages
	Total	32	pages

Note: This Addendum shall be included as part of the Contract Documents. Items in this Addendum apply to all drawings and specification sections whether referenced or not involving the portion of the work added, deleted, modified, or otherwise addressed in the Addendum. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to Disqualification.

While we contend that SB220 should only be potentially applicable to a contract issued after the effective date of said bill, this is to clarify that for purposes of this contract, regardless of the execution or effective dates of this contract, the status of Utah Law and remedies available to the State of Utah and DFCM, as it relates to any matter referred to or affected by said SB220, shall be the Utah law in effect at the time of the issuance of this Addendum.

1.1 **SCHEDULE CHANGES:** No Project Schedule changes.

1.2 **GENERAL ITEMS:** See attached Architect's Addendum No. 1

Addendum #1
Price Armory – Structural repairs and upgrades
548 North 500 East
Price, Utah
DFCM Project # 08297480

Sheet AD101

Keyed Note 18 covered by the architects seal shall read as follows :

18. **EXISTING GARAGE FLOOR TO BE REMOVED.**

Add Keyed Note 19 in Drill Hall 100 as follows.

19. **REMOVE EXISTING WOOD ATHLETIC FLOOR & PREP AREA FOR NEW WOOD ATHLETIC FLOOR INSTALLATION.**

Revise basement demolition plan drawing to show demolishing the wall and door between Entry 06 and Garage 01 as shown on the attached partial plan AD101.

Correct north arrow – should point to left side of page.

Sheet AE101

Add Keyed Note 11 in Drill Hall 100 as follows:

11. **INSTALL NEW WOOD AHTLETIC FLOOR IN DRILL HALL.**

Add Keyed Note 12 in Garage 01 as follows:

12. **REPLACE CONCRETE FLOOR SLAB IN GARAGE – SEE STRUCTURAL**

Revise basement floor plan drawing to show a new wall with new door between Entry 06 and Garage 01 as shown on the attached partial plan AE101.

Sheet AE701

Replace entire sheet AE701 with attached sheet AE701R

Specifications:

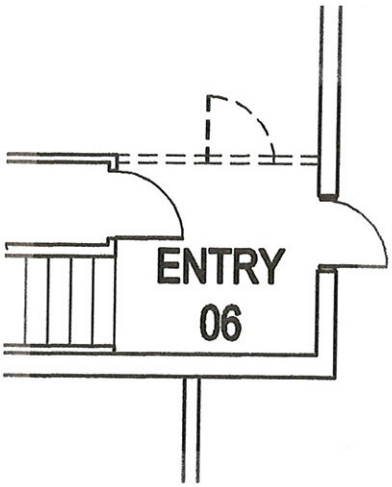
Add Attached Specification Section 122113 and provide window blinds in rooms 103, 104, 105, 106, 107, 108, 109, 110, 113, 114, 115, 121, 126, 123, 124.

Sheet P101

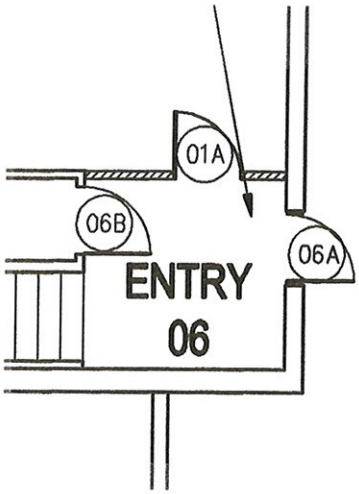
Keyed note #10 on the drawing should be #8 to match the notes in the note column on the right side of the sheet.

For Reference only attachments.

See Geotechnical Study for the Price Armory dated Nov 11, 2008, attached for reference only.



Partial AD101



Partial AE101

ADDENDUM #1
Price Armory Upgrade, Price, Utah
DFCM Project # 08297480

EFT ARCHITECTS INC.

DOOR SCHEDULE

DOOR #	ROOM NAME	DOOR TYPE	DOOR NEW DOOR	DOOR SIZE	DOOR GLASS	FRAME PROFILE	FRAME FRAME TYPE	THRESHOLD	HARDWARE GROUP	FIRE RATING	REMARKS
101A	ENTRY 101	A	X	S2	IG2	B	2	T1	HW-1		NEW STOREFRONT SYSTEM PANIC HARDWARE
101B	ENTRY 101	A	X	S2	G2	B	3	T1	HW-2		NEW STOREFRONT SYSTEM
102	ENTRY 102	M									EXISTING DOOR & JAMB REPAINT
103	CLASSROOM 103	W	X	S1		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
104	COMMO 104	W	X	S1		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
105	OFFICE 105	W	X	S1		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
106	OFFICE 106	W	X	S1		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
107	OFFICE 107	W	X	S1		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
108A	OFFICE 108A	W	X	S1		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
108B	OFFICE 108B	W	X	FV		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
109	CLASSROOM 109	W	X	S1		EX	EX		HW-5		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
110	QUARTERS 110	W	X	S1		EX	EX		HW-5		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
111	WOMEN'S 111	W	X	S1		EX	EX		HW-3		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
112	MEN'S 112	W	X	S1		EX	EX		HW-3		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
113	OFFICE 113	W	X	FV		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
114	OFFICE 114	W	X	S1		EX	EX		HW-4		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
115	SUPPLY 115	M	X	FV		EX	EX		HW-5		REPAINT EXISTING JAMB – OFCI DOOR & CFCI HW
116	VAULT 116	V									EXISTING DOOR PAINT
117A	KITCHEN 117	W	X	S1		A	1		HW-4	20 MIN.	NEW CFCI DOOR & HW
117B	KITCHEN 117										ROLL UP COUNTER DOOR
118	CUST/LAUNDRY 118	W	X	FV		A	1		HW-5		REPAINT EXISTING JAMB – CFCI DOOR & CFCI HW
119	STORAGE 119	W	X	S1		A	1		HW-5		REPAINT EXISTING JAMB – CFCI DOOR & CFCI HW
120	VAULT 120	V									EXISTING DOOR PAINT
121	PHYSICAL FITNESS 121	M	X	FV		EX	EX		HW-5		REPAINT EXISTING JAMB – CFCI DOOR & CFCI HW
122	LOCKERS/BALCONY 122	N/A									
123	CLASSROOM 123	W	X	S1		A	1		HW-5		NEW CFCI DOOR & HW
124	CLASSROOM 124	W	X	S1		A	1		HW-5		NEW CFCI DOOR & HW
125	STORAGE 125	W	X	S1		A	1		HW-5		NEW CFCI DOOR & HW
126	COMPUTER ROOM 126	W	X	S1		A	1		HW-5		NEW CFCI DOOR & HW
01A	GARAGE 01	M	X	S1		A	1		HW-5		REPLACE WOOD FRAME W/ METAL
01B	GARAGE 01	M									EXISTING ROLL UP DOOR PAINT
01C	GARAGE 01	M									EXISTING ROLL UP DOOR PAINT
01D	GARAGE 01	M									EXISTING ROLL UP DOOR PAINT
01E	GARAGE 01	M									EXISTING ROLL UP DOOR PAINT
02	OFFICE 02	M	X	S1		A	1		HW-5		NEW CFCI DOOR & HW
03	STORAGE 03	M	X	S1		A	1		HW-5		NEW CFCI DOOR & HW
04	MECHANICAL 04	W				EX	EX				EXISTING DOOR PAINT
05	COAL ROOM 05	N/A									
06A	ENTRY 06	M				EX	EX				EXISTING DOOR PAINT
06B	ENTRY 06	W	X	S1		A	1		HW-5		REPLACE WOOD FRAME W/ METAL

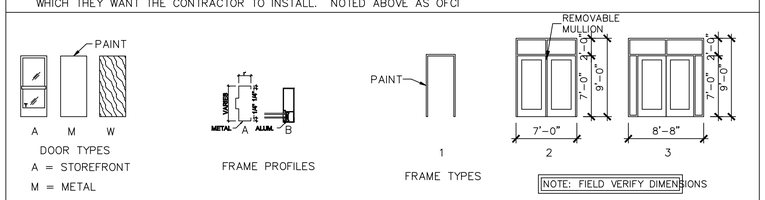
S	SIZE
S1	3'-0" x 7'-0" x 1 3/4"
S2	DOUBLE 3'-3" x 7'-0" x 1 3/4"
FV	FIELD VERIFY DOOR SIZE

T	THRESHOLD
T1	ACCESSIBLE METAL THRESHOLD

GENERAL NOTES:

CFCI = CONTRACTOR FURNISHED CONTRACTOR INSTALLED
OFCI = OWNER FURNISHED CONTRACTOR INSTALLED

1. DOORS TO BE SET TO CLEAR FINISHED FLOOR SURFACE BY 1/2"
2. NOTE: THE GUARD HAS 7 OAK DOORS THEY HAVE PURCHASED AND FINISHED WHICH THEY WANT THE CONTRACTOR TO INSTALL. NOTED ABOVE AS OFCI



FINISH SCHEDULE

ROOM NO.	ROOM NAME	BASE MATERIAL & FINISH	FLR. MATERIAL & FINISH	WALLS NORTH MATERIAL & FINISH	WALLS EAST MATERIAL & FINISH	WALLS SOUTH MATERIAL & FINISH	WALLS WEST MATERIAL & FINISH	CEILING TYPE MATERIAL & FINISH	CEILING HEIGHT	MISC. NOTES
100	DRILL HALL	RB	W/EX	PM	PM	PM	PM	P	EX	1
101	ENTRY	RB	CT-4/CTW	PM	PM	PM	PM	AC	EX	
102	ENTRY	RB	VCT	PM	P	PM	P	AC	10'-0"	
103	CLASSROOM	RB	C	PM	PM	PM	P	AC	EX	2
104	COMO	RB	C	PM	PM	PM	PM	AC	EX	
105	OFFICE	RB	C	PM	PM	PM	PM	AC	EX	
106	OFFICE	RB	C	PM	PM	PM	PM	AC	EX	
107	OFFICE	RB	C	PM	PM	PM	PM	AC	EX	
108	OFFICE	RB	C	PM	PM	PM	PM	AC	EX	
109	CLASSROOM	RB	C	PM	P/PM	PM	PM	AC	EX	
110	QUARTERS	RB	C	P/PM	PM	PM	PM	AC	EX	
111	WOMEN'S	CT-3	CT-1	P/CT-3	P/CT-3	PM/CT-3	P/CT-3	P	EX	
112	MEN'S	CT-3	CT-1	PM/CT-3	P/CT-3	P/CT-3	P/CT-3	P	EX	
113	OFFICE	RB	C	PM	P	PM	PM	AC	EX	
114	OFFICE	RB	C	PM	PM	PM	P	AC	EX	
115	SUPPLY	RB	VCT	PM	PM	PM	PM	AC	EX	
116	VAULT	RB	EX	PM	PM	PM	PM	P	EX	
117	KITCHEN	CT-3	CT-2	CT-3	CT-3	CT-3	CT-3	P	EX	
118	CUSTODIAN/LAUNDRY	EX	CT-1	P	P	P	P	P	EX	
119	STORAGE	RB	VCT	PM	PM	PM	PM	P	EX	
120	VAULT	RB	EX	PM	PM	PM	PM	P	EX	
121	PHYSICAL/FITNESS	RB	VCT	PM	PM	PM	P	P	EX	
122	LOCKER/BALCONY	RB	EX	PM	N/A	PM	PM	P	EX	1
123	CLASSROOM	RB	C	P	P	PM	P	P/AC	12'-0"	
124	CLASSROOM	RB	C	P	P	PM	P	P/AC	12'-0"	
125	STORAGE	RB	EX	P	P	PM	P	AC	9'-0"	
126	I.T.	RB	VCT	PM	PM	P	P	AC	EX	
01	GARAGE	N/A	CON	PM	P	PM	PM/P	EX	EX	
02	OFFICE	RB	CON	P	PM	PM	P	P	EX	
03	STORAGE	RB	CON	PM	PM	P	P	P	EX	
04	MECHANICAL	N/A	EX	EX	EX	EX	EX	EX	EX	
05	COAL ROOM	N/A	EX	EX	EX	EX	EX	EX	EX	
06	ENTRY	RB	CON	PM	P	PM	PM	P	EX	

WALLS
P = PAINTED GYP.BD.
PM = PAINTED MASONRY
CT-3 = CERAMIC TILE
EX = EXISTING TO REMAIN

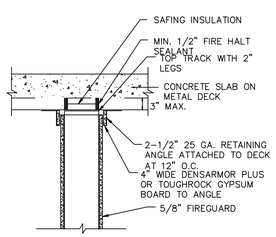
FLOOR
CT-1 = CERAMIC TILE
CT-2 = QUARRY TILE
CT-3 = CERAMIC TILE
CT-4 = PAVER TILE AT ENTRY
C = CARPET TILE
VCT = VINYL TILE
EX = EXISTING TO REMAIN
CTW = CARPET TILE (WALK OFF)
W = WOOD SPORTS FLOOR
CON = NEW CONCRETE SEE STRUCT.

BASE
RB = RESILIENT BASE
CT-3 = CERAMIC TILE
EX = EXISTING TO REMAIN

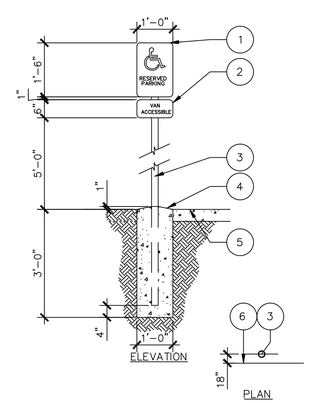
CEILING
P = PAINTED GYP.BD.
EX = EXISTING TO REMAIN
AC = SUSPENDED ACOUSTICAL PANEL CEILING

MISC. NOTES 1 REPAINT WALLS TWO TONE TO MATCH EXISTING LEVELS AND ENTIRE CEILING, BEAMS & COLUMNS.
2 EXTEND GYP. BD. LAMINATED TO CMU WALL UP TO 8'-0" ON UP TO CEILING HEIGHT. APPROX. 10'-0"

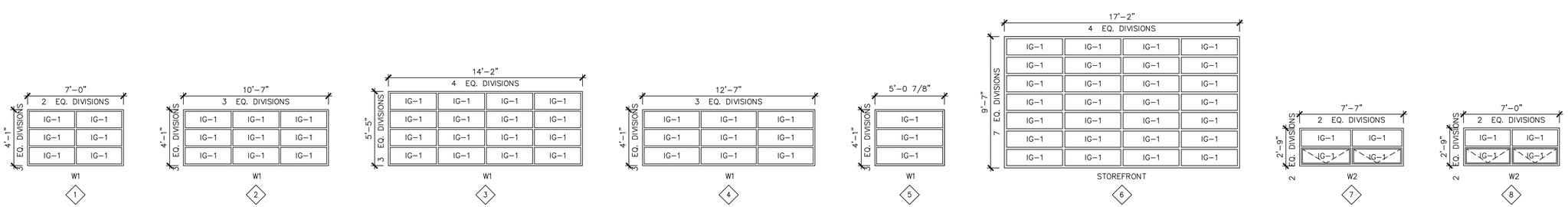
GENERAL NOTE: CAULK AND REPAIR ALL CRACKS WHERE THEY OCCUR IN EXISTING CMU WALLS PRIOR TO PAINTING.



H18 FIRE WALL DETAIL
1"=1'-0"



TYPICAL ACCESSIBLE SIGNAGE FOOTING
SCALE: 1/2" = 1'-0"



M18 WINDOW SCHEDULE
1/4"=1'-0"

EFT ARCHITECTS
265 East 100 South Suite 350
Salt Lake City, Utah 84111-1904
Ph (801) 521-8584 Fax (801) 355-2938

CONSULTANT INFORMATION

KEYED NOTES

STATE OF UTAH ERIC R. THOLEN 129665 LICENSED ARCHITECT
6-17-09

Utah National Guard
PRICE ARMORY - STRUCTURAL REPAIRS AND UPGRADES
584 NORTH 500 EAST
PRICE, UTAH

SHEET TITLE
FINISH & DOOR SCHED.

REVISIONS	DATE	BY	DESCRIPTION
△			
△			
△			
△			

DRAWN BY JRA
CHECKED BY ERT
PROJECT NO. 08297840
DATE JUNE 17, 2009
DRAWING NO. AE701R

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Horizontal louver blinds with aluminum slats.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

C. Samples for Initial Selection: For each type and color of horizontal louver blind indicated.

1. Include similar Samples of accessories involving color selection.

D. Window Treatment Schedule: For horizontal louver blinds.

E. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers whose products may be incorporated into the Work include, but are not limited to, the following:

1. Hunter Douglas.
2. Levolor, a Newell Rubbermaid Company.
3. Springs Window Fashions Division, Inc.

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.

1. Width: 1 inch.
2. Thickness: Not less than 0.008 inch.
3. Finish: One color.

a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.

C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and the following:

1. Capacity: One blind per headrail.
2. Integrated Headrail/Valance: Curved face.

D. Bottom Rail: Formed-steel or extruded-aluminum tube, with plastic or metal capped ends top contoured to match crowned shape of slat; with enclosed ladders and tapes to prevent contact with sill.

E. Ladders: Evenly spaced to prevent long-term slat sag.

1. For Blinds with Nominal Slat Width 1 Inch or Less: Braided string.

F. Lift Cords: Manufacturer's standard with safety feature to prevent choking.

G. Tilt Control: Enclosed worm-gear mechanism and linkage rod, and the following:

1. Tilt Operation: Manual with clear plastic wand.
2. Length of Tilt Control: Length required to make operation convenient from floor level.
3. Tilt: Full.

H. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.

I. Tilt-Control and Cord-Lock Position: Right side of headrail, unless otherwise indicated.

J. Valance: Two slats.

1. Finish Color Characteristics: Match color, texture, pattern, and gloss of slats.

K. Mounting: Head mounting, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.

1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

L. Colors, Textures, Patterns, and Gloss: As selected by Architect from manufacturer's full range.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

A. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.

C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.

D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing

to supporting substrate; and supporting blinds and accessories under conditions of normal use.

E. Color-Coated Finish:

1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 2 inches to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.

3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122113

Gordon Spilker Huber
Geotechnical Consultants, Inc.

REPORT
GEOTECHNICAL STUDY
PROPOSED UTAH NATIONAL GUARD
PRICE ARMORY – SEISMIC EVALUATION
600 NORTH VETERANS LANE
PRICE, UTAH

Submitted To:

Harris & Associates, Inc.
265 East 100 South, Suite 350
Salt Lake City, Utah 84111

Submitted By:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

November 11, 2008

Job No. 0461-004-08

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

November 11, 2008
Job No. 0461-004-08

Harris & Associates, Inc.
265 East 100 South, Suite 350
Salt Lake City, Utah 84111

Attention: Mr. Eric Tholen, AIA

Gentlemen:

Re: Report
Geotechnical Study
Utah National Guard Price Armory - Seismic Evaluation
600 North Veterans Lane
Price, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the Utah National Guard Price Armory, which is located at 600 North Veterans Lane in Price, Utah. The purpose of this report is to provide geotechnical parameters for a seismic upgrade of the existing structure. The general location of the site with respect to major topographic features and existing facilities, as of 1972, is presented on Figure 1, Vicinity Map. A more detailed aerial photograph of the site showing the locations of existing roadways and facilities is presented on Figure 2, Site Plan. The locations of the borings drilled in conjunction with this study are also presented on Figure 2.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. Eric Tholen of Harris & Associates, Inc., and Mr. Alan Spilker of Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil, bedrock, and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, and geoseismic recommendations to be utilized for the structural upgrade of the existing armory building.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of drilling, logging, and sampling of six borings.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided verbally subsequent to being provided our Professional Services Agreement 08-0713 dated July 8, 2008.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. EXISTING STRUCTURE

An existing one- to two-level structure is located at the site and is constructed of concrete frame with brick veneer. A structural upgrade is proposed for the existing building. Foundation plans indicate that the structure was originally designed in 1956 and that the interior of the structure is supported primarily with structural walls with integrated columns. Bearing capacity of the existing site soils for the original design are not defined but are anticipated to be between 2,000 and 2,500 pounds per square foot. Maximum real column and wall loads for the structure were provided by Reaveley Engineers and are 55 kips and 6.9 kips per lineal foot, respectively. New loads associated with shear walls and updated seismic parameters are unavailable at this time and will need to be evaluated once the structural evaluation is completed. Floor slab loads are anticipated to be light (less than 200 pounds per square foot average uniform loading). As part of the seismic upgrade, it is anticipated that new footings will be installed to augment the

existing footing and foundation system. New footings will be dowelled into existing footings to create an overall larger footing.

Building distress was observed in the form of cracks within the exterior brick veneer and interior concrete frame. The cracks ranged from one-sixteenth to one-half inch. Cracks were concentrated around the corners of window, doors, within floor slabs, and along the seams of interior concrete slabs.

At-grade paved parking and roadway areas are located north, east, and south of the site. Newly placed asphalt concrete was observed north of the existing structure.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil, bedrock, and groundwater conditions at the site, six borings were explored to depths ranging from six to nine and one-half feet below existing grade. The borings were drilled using a drill rig equipped with hollow-stem augers. Locations of the borings are presented on Figure 2.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils/bedrock encountered were obtained for subsequent laboratory testing and examination. The soils/bedrock were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3F, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 4, Unified Soil Classification System. Bedrock was classified in accordance with the nomenclature described on Figure 5, Rock Description Terminology.

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) was utilized in the majority of the subsurface sampling at the site. Additionally, a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) was utilized at select locations. The blow-counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of drilling operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Borings B-1 and B-6 in order to provide a means of monitoring the groundwater fluctuations.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was initiated. The program included moisture and density, Atterberg limits, collapse/swell-consolidation, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 3A through 3F.

3.2.3 Atterberg Limits Test

To aid in classifying the soils and to help correlate other test data, an Atterberg limits test was performed upon a selected sample. Results of the test are tabulated below:

Boring No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
B-3	1.5	31	21	10	CL

3.2.4 Collapse/Swell-Consolidation Tests

To provide data necessary for our settlement analyses, collapse/swell-consolidation tests were performed on each of three representative samples of the fine-grained soils encountered at the site. The collapse/swell portion of the overall test was performed in accordance with the following procedure:

1. The sample is loaded to a specified axial pressure at in-situ moisture content.
2. The resulting axial deflection is measured and recorded.
3. The sample is saturated.
4. The resulting collapse/swell is measured and recorded.

A tabulation of the results of the collapse/swell portion of the tests is presented on the following page.

Boring No.	Depth (feet)	Soil Type	Natural Dry Density (pcf)	Natural Moisture Content (percent)	Axial Load When Saturated (psf)	Collapse (-) or Swell (+) (percent)
B-1	5.5	CL	119	13.3	1,600	(+) 0.21 swell pressure ~ 2,000 psf
B-2	7.5	CL	126	10.2	1,600	(+) 2.15 swell pressure ~ 9,600 psf
B-3	3.5	CL	125	7.0	1,600	(+) 0.13 swell pressure ~ 2,000 psf

The test results indicate that the soils tested are highly over-consolidated and will exhibit expansive characteristics under the anticipated loading conditions. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

3.2.5 Chemical Tests

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the silty clay soils encountered in Boring B-4 at a depth of one and one-half feet below existing grade. The results of the chemical tests are tabulated below:

Boring No.	Depth (feet)	pH	Total Water Soluble Sulfate (mg/l)
B-4	1.5	7.62	1,000

4. SITE CONDITIONS

4.1 SURFACE

The site is located at 600 North Veterans Lane in Price, Utah. The general site layout is shown on Figure 2. The site is relatively flat with a downward slope to the south and an overall relief of approximately four to five feet. The existing Utah National Guard Price Armory structure is located on the site and appears to have foundations/footings that step-down to the south following the slope of the site. Access garages are located on the south side of the structure and appear to be slightly below the grade of the eastern and northern portions of the site. The majority of the site outside the structure is covered with asphalt concrete and gravel parking areas, landscaped lawns, flower beds, and trees up to 20 feet high. Bordering the site to the east is Veterans Lane with a cemetery beyond; to the north by 600 North Street with a sports complex beyond; to the west by a soccer field; and to the south by a gravel-covered parking area.

4.2 SUBSURFACE SOIL AND GROUNDWATER

The subsurface sequence encountered in the borings is relatively similar across the site. From the surface in Borings B-2 through B-5 are asphalt concrete pavement sections consisting of two and one-half to three and one-half inches of asphalt concrete underlain by four and one-half to six and one-half inches of roadbase. An additional one foot of fill comprised of silty clay with some fine and coarse gravel was encountered below the roadbase in Boring B-2.

Underlying the surficial pavements and fills and extending to the explored depths of six to nine and one-half feet is silty clay with some fine sand. The silty clay is very stiff to hard, moist, brown, and expands with significant moisture increase. Swell pressures of 2,000 to 9,600 pounds per square foot were observed during laboratory testing with a total swell of 0.13 to 2.15 percent.

Auger refusal was observed on bedrock at the explored depths at each boring location.

No evidence of groundwater was encountered within the borings across the site and is anticipated to be at a depth greater than nine and one-half feet. Due to the depth of groundwater, it will not likely affect project parameters.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The most significant geotechnical aspect of the site is the slightly to highly expansive silty clay soils encountered in the upper nine and one-half feet. Laboratory tests indicated that the very stiff to hard silty clays exhibit an expansive characteristic and will tend to swell with significant changes in moisture content. Evidence of the expansive nature of the underlying soils is the cracking observed within brick veneer, concrete frame, and floor slabs of the structure.

Expansive soil sites are typically remediated by installing micropiles near existing footings, attaching brackets from the top of the micropile to the bottom of the footings, and hydraulically raising the structure. All interior floor slabs would be demolished to access interior columns for the retrofit. Micropiles would also be installed under new footings to provide vertical support. Newly constructed interior floor slabs would also be structurally supported upon micropiles.

Due to the very stiff/hard soils encountered at the site, micropiles are recommended for foundation support. Helical piers will not likely be able to penetrate through the very stiff/hard soils to a suitable depth. Therefore, if this option is to be pursued, it is highly recommended that a test helical pier be attempted. It is anticipated that bedrock will be encountered at depths of six to nine and one-half feet. We also recommend that full-scale pile testing be used to verify bearing and pullout strengths.

Due to the economical costs of micropiles and retrofitting footings and slabs, GSH was requested to provide recommendations to allow the structure to remain on the existing soil profile. Existing footings were placed overlying potentially expansive soils and new footings are anticipated to be placed surrounding and structurally connected to existing footings. If new and existing footings are to remain supported upon potentially expansive soils, the recommendations provided by GSH will not alleviate existing structural distress and additional structural deformation will likely occur. Recommendations for new and existing footings are provided in Section 5.2.2, Spread and Continuous Wall Foundation.

As previously mentioned, new loads associated with shear walls and updated seismic parameters are unavailable at this time and will need to be evaluated once the structural evaluation is completed.

In the following sections, detailed discussions pertaining to micropile foundations, spread and spot foundations, floor slabs, cement types, and the geoseismic setting of the site are provided.

5.2 FOUNDATIONS

5.2.1 Micropile Foundations

GSH recommends that two types of micropiles be evaluated: Injection-bore micropiles and open-hole micropiles. Injection-bore micropiles are constructed by using a hollow-centered tendon fitted with a four-inch diameter disposable drilling bit. The tendon is used as the drilling rod while flushing the cuttings out with pressurized water during installation. After the drilling is completed to the required depth, a PVC sleeve is fitted over the tendon down to the top of the desired bonded length as a bond breaker. A Portland cement grout slurry is then injected utilizing a 140 pounds per square inch capacity pump through the center of the tendon into the hole. A seal or cap is not typically used, which allows for pressurized grouting beyond the static head of the grout column.

Open-hole micropiles are constructed by drilling to the specified depths using a four-inch diameter hollow-stem auger drill, inserting a No. 8 steel tendon in the hole, and pouring Portland cement grout slurry into the hole through a tremmie pipe. The upper level of the grouted zone is measured with a down-hole measurement tape.

The grout within each test micropile will be allowed a minimum of three days to set up. Afterward, each micropile shall be pull tested to failure using a hydraulic jack attached to the steel tendon.

As previously mentioned, an alternative to micropiles is helical piers; however, due to the very stiff/hard nature of the existing soils, helical piers will not likely be able to penetrate to a suitable depth.

Subsequent to the installation of micropiles, foundation brackets shall be installed to the tendon of each pile and fitted to the existing footings. The structure may be lifted using hydraulic lifting jacks. GSH recommends that a minimum gap of one and one-half inches be maintained over the existing expansive soils.

5.2.2 Spread and Continuous Wall Foundation

New footings placed surrounding and structurally connected to existing footings may be established upon undisturbed natural soils that are continuous with soils underlying the adjacent existing footings. To reduce the potential for differential movement, new footings shall be placed on natural soils or limited thicknesses of structural fill no thicker than six inches. Site drainage and moisture control will need to be provided for the structure as described in Section 5.3, Site Drainage and Moisture Protection. If new and existing footings are to remain supported upon potentially expansive soils, the recommendations provided by GSH will not alleviate existing structural distress and additional structural deformation will likely occur. For design, the following parameters are recommended:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 18 inches
Minimum Recommended Width for Isolated Spread Footings	- 24 inches
Recommended Total Maximum Net Bearing Pressure	- 3,000 pounds per square foot
Bearing Pressure Increase for Seismic Loading	- 50 percent

The term “net bearing pressure” refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.3 SITE DRAINAGE AND MOISTURE PROTECTION

Because of the existing expansive soils, it is our recommendation that positive site drainage be provided during construction and incorporated into the design of the proposed facility.

Backfill over utilities and foundations must consist of structural fill with a minimum of 25 percent fines as to be less permeable.

The ground surface and at-grade slabs around the immediate perimeter of the structure must slope at least 2 percent away from the structure. Preferred distance is 15 to 20 feet. GSH recommends that a concrete apron be installed around the immediate perimeter of the structure and extending out a minimum of 10 feet. Irrigated landscaping is not recommended within 15 feet of the existing structure.

All water-conveying utilities must be checked for leaks prior to backfilling and constructed with flexible joints. Roof drains must be piped to a minimum distance of 15 feet from the perimeter of the existing structure.

5.4 FLOOR SLABS

If micropiles of helical piers are to be utilized, floor slabs must be designed as structural slabs supported on micropiles with a minimum gap of one and one-half inches. If floor slabs are to be placed overlying the existing expansive soils, a floating slab must be used to isolate the movement of floor slabs from the foundations. As a third option, potentially expansive soils may be completely removed underneath floor slabs and replaced with granular structural fill. Under no circumstances shall floor slabs be established upon loose or disturbed soils/fills, sod, rubbish, non-engineered fills, deleterious materials, frozen soils, or within ponded water.

5.5 CEMENT TYPES

The laboratory tests indicate that the natural clayey soils contain a high amount of water soluble sulfates. Based on our test results, concrete in contact with the site soil will have a high potential for sulfate reaction (ACI 318, Table 4.3.1). To achieve the required protection against sulfate-related corrosion, we recommend a maximum water-to-cement ratio of 0.5 (by weight, normal weight aggregate concrete) and using Type V, or equivalent sulfate protection cement, in concrete to obtain a minimum compressive strength of 4,000 pounds per square inch (psi). Details can be found in the above ACI reference and in the Portland Cement Association publication, “Design and Control of Concrete Admixtures.”

5.6 GEOSEISMIC SETTING

5.6.1 General

Utah municipalities adopted the International Building Code (IBC) 2006 on January 1, 2007. The IBC 2006 code determines the seismic hazard for a site based upon 2002 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

The structure must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2006 edition.

5.6.2 Faulting

Based on our review of available literature, no active faults pass through or immediately adjacent to the site.

5.6.3 Soil Class

For dynamic structural analysis, the Site Class C – Very Dense Soil and Soft Rock Profile, as defined in Table 1613.5.2, Site Class Definitions of the IBC 2006, can be utilized.

5.6.4 Ground Motions

The IBC 2006 code is based on 2002 USGS (United States Geologic Survey) mapping, which provides values of short and long period accelerations for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for a MCE event and incorporates a soil amplification factor for a Site Class C soil profile in the second column. Based on the site latitude and longitude (39.60937 degrees north and 110.80079 degrees west, respectively), the values for this site are tabulated below:

Spectral Acceleration Value, T Seconds	Site Class B-C Boundary [mapped values] (% g)	Site Class C [adjusted for site class effects] (% g)
Peak Ground Acceleration	18.6	22.4
0.2 Seconds, (Short Period Acceleration)	$S_S = 46.6$	$S_{MS} = 55.9$
1.0 Seconds (Long Period Acceleration)	$S_1 = 15.3$	$S_{M1} = 25.2$

The IBC 2006 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (adjusted for site class effects) for the MCE event by two-thirds (⅔).

5.6.5 Liquefaction

Liquefaction is defined as the condition when saturated, loose, fine sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event.

Due to the cohesive nature of the majority of the site soils, the shallow depth to bedrock, and the depth of the groundwater level, the probability of liquefaction at the site during the design seismic event is considered low.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

GSH Geotechnical Consultants, Inc.

Alan D. Spilker, State of Utah No. 334228
Professional Engineer

Reviewed by:

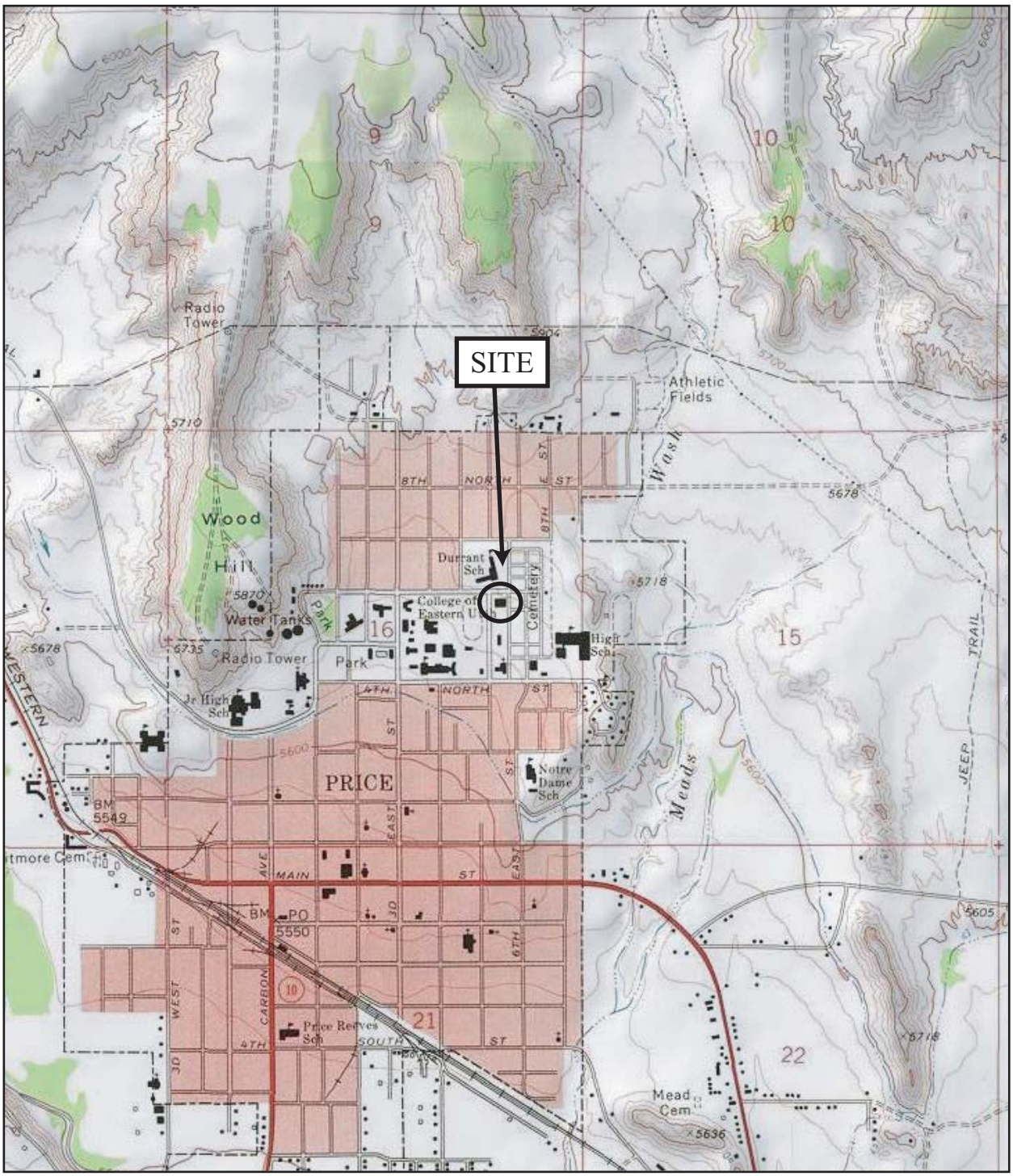
Michael S. Huber, State of Utah No. 343650
Professional Engineer

ADS/MSH:jlh

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3F, Log of Borings
Figure 4, Unified Soil Classification System
Figure 5, Rock Description Terminology

Addressee (3 + email)

HARRIS & ASSOCIATES, INC.
JOB NO. 0461-004-08



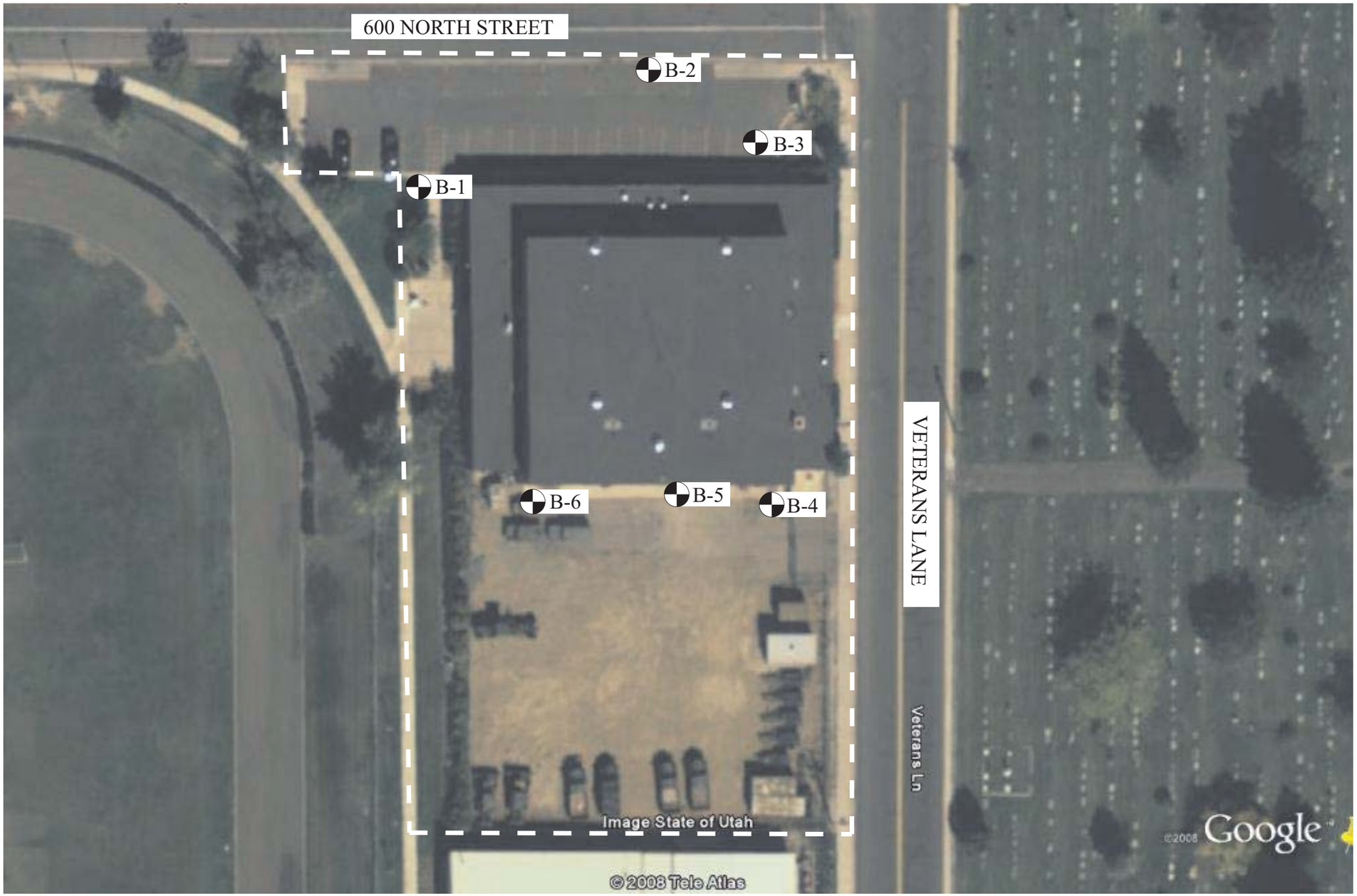
SCALE IN FEET
1000 0 1000 2000

FIGURE 1
VICINITY MAP

REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP
TITLED "PRICE, UTAH" AND "HELPER, UTAH"
BOTH DATED 1972

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

HARRIS & ASSOCIATES, INC.
JOB NO. 0461-004-08



NOT TO SCALE

REFERENCE:
ADAPTED FROM AERIAL PHOTOGRAPH
GOOGLE EARTH 2008

FIGURE 2
SITE PLAN

GSH
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Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Utah National Guard Price Armory
Project No.: 0461-004-08
Location: 600 North Veterans Lane, Price, Utah
Client: Harris & Associates, Inc.
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 10-02-08
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 5660' +/-
Water Level: No groundwater encountered (10-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY with some fine sand; major roots (topsoil) to 2"-3"; trace organics; slightly blocky structure; brown (CL)									loose to 3"-4" moist stiff
				15							
		grades with occasional fine and coarse gravel; trace organics; oxidation	5	48							very stiff
		grades silty clay with some fine sand; oxidation and		119							hard
				50+							
		Drilling refusal at 9.5' on massive bedrock.	10								
		Stopped sampling at 9.5'.									
		Installed 1-1/4" diameter slotted PVC pipe to 9.5'.									
		No groundwater encountered at time of drilling.									
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Utah National Guard Price Armory
Project No.: 0461-004-08
Location: 600 North Veterans Lane, Price, Utah
Client: Harris & Associates, Inc.
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 10-02-08
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 5660' +/-
Water Level: No groundwater encountered (10-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		3.5" ASPHALT CONCRETE									moist
		ROADBASE, FILL brown, FILL									medium dense moist
		SILTY CLAY. FILL with some fine and coarse gravel; brown and dark brown, FILL (CL)		35							very stiff moist
		SILTY CLAY with some fine sand; blocky; brown (CL)		21							very stiff stiff
		grades with occasional fine and coarse gravel; trace organics; oxidation	5	92							hard
		grades silty clay with some fine sand; oxidation and calcium deposits		100+							
		Drilling refusal at 8.5' on massive bedrock.									
		Stopped sampling at 8.5'.	10								
		No groundwater encountered at time of drilling.									
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3B

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Utah National Guard Price Armory
Project No.: 0461-004-08
Location: 600 North Veterans Lane, Price, Utah
Client: Harris & Associates, Inc.
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 10-02-08
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 5660' +/-
Water Level: No groundwater encountered (10-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		3.5" ASPHALT CONCRETE									
		ROADBASE 3/4", FILL brown, FILL									moist hard
		SILTY CLAY with some fine sand; blocky; brown with calcification (CL)		70							
				94							
		grades with occasional fine and coarse gravel; trace organics; oxidation	5	132							
		Drilling refusal at 6.5' on massive bedrock. Stopped sampling at 6.5'. No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3C

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Utah National Guard Price Armory
Project No.: 0461-004-08
Location: 600 North Veterans Lane, Price, Utah
Client: Harris & Associates, Inc.
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 10-02-08
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 5660' +/-
Water Level: No groundwater encountered (10-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		3.5" ASPHALT CONCRETE									
		ROADBASE 3/4" brown									moist hard
		SILTY CLAY with some fine sand; blocky structure; grayish-brown with calcification (CL)		145							
				134							
		grades with occasional fine and coarse gravel; trace organics; oxidation	5	100+							
		Drilling refusal at 6.5' on massive bedrock.									
		Stopped sampling at 6.5'.									
		No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3D

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Utah National Guard Price Armory
Project No.: 0461-004-08
Location: 600 North Veterans Lane, Price, Utah
Client: Harris & Associates, Inc.
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 10-02-08
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 5660' +/-
Water Level: No groundwater encountered (10-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		2.5" ASPHALT CONCRETE									
		ROADBASE									
		SILTY CLAY with some fine sand; blocky structure; cementation; grayish-brown (CL)		130							moist hard
				160+							
		grades with occasional fine and coarse gravel; trace organics; oxidation	5	100+							
		Drilling refusal at 6.5' on massive bedrock.									
		Stopped sampling at 6.5'.									
		No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3E

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

Project Name: Proposed Utah National Guard Price Armory
Project No.: 0461-004-08
Location: 600 North Veterans Lane, Price, Utah
Client: Harris & Associates, Inc.
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 10-02-08
GSH Field Rep.: RJG
Elevation: Overall Site Approximately 5660' +/-
Water Level: No groundwater encountered (10-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface									
		SILTY CLAY (gravel 1" minus) with some fine sand; blocky structure; brownish-gray with cementation (CL)	0								moist hard
				93							
			5	154+							
		Drilling refusal at 6.0' on massive bedrock.									
		Stopped sampling at 6.0'.									
		Installed 1-1/4" diameter slotted PVC pipe to 5.5'.									
		No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3F

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. [2] (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.

IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE		DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)	GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
		Medium to high	None to very slow	Medium		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to medium	Slow	Slight		OL	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		High to very high	None	High		CH	Inorganic clays of high plasticity, fat clays.
		Medium to high	None to very slow	Slight to medium		OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.				Pt	Peat and other highly organic soils.

[1] Boundary classifications: –Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW–GC, well graded gravel–sand mixture with clay binder.
[2] All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

1. In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. There rore, actual designations (based on laboratory testing) may differ.

2. Lines seperating strata on the logs represent approximate boundaries only Actual transitions may be gradual.

3. Logs represent general soil conditions observed at teh point of exploration onthe date indicated.

4. No warranty is provided as to the continuity of soil conditions between individual sample locations.

FINE - GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNDRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.25 - 0.5	Easily penetrated 1 " by Thumb . Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.5 - 1.0	Penetrated over 1/2 " by Thumb with moerate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0	Indented about 1/2 " by Thumb but penetrated only with great effort
Very Stiff	15 - 30	1.0 - 2.0	2.0 - 4.0	Readily indented by Thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty by Thumbnail

LOG KEY SYMBOLS

- Bulk / Bag Sample
- Thin Wall
- Standard Penetration Split Spoon Sampler
- No Recovery
- Rock Core
- 3-3/4" ID D&M Sampler
- 3" ID D&M Sampler
- Water Level
- California Sampler

COARSE -GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2 " reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2 " reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2 " reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2 "
LAYER	1/2 - 12 "

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than on per foot of thichness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakely	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

MODIFIERS

DESCRIPTION	%
Trace	<5
Some	5 - 12
With	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 4

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ROCK DESCRIPTION TERMINOLOGY

ROCK QUALITY DESIGNATION (RQD):

Percentage of rock core per core run which is relatively south and unfractured and which is longer than 4 inches in length. Rock which is soft or weathered, closely jointed, or rock from which the core recovery is low, will have poor to fair RQD.

ROCK DEFECT SPACING:

Spacing	Qualifier for Joints Faults & Fractures	Qualifier for Bedding
Less than 2 inches	very close	very thin
2 inches to 1 foot	close	thin
1 foot to 3 feet	moderately close	medium
3 feet to 10 feet	wide	thick
greater than 10 feet	very wide	very thick

DEGREE OF WEATHERING

Symbol	Descriptive Term	Properties
Dec	Decomposed	Generally soil-like, can be crumbled by hand pressure
HiW	Highly weathered	Generally rock-like, can be broken easily, but crumbles with difficulty by hand
MdW	Moderately weathered	Fabric stained rusty brown, can be indented by steel nail, breaks only with difficulty
SlW	Slightly weathered	Open discontinuities are weathered, coated, but only slight weathering of rock mass, generally no indented by steel nail
UnW Ex Jts	Unweathered except joints	Weathering limited to the surface of discontinuities; fabric is fresh throughout but most joints shown rusty stain and/or soil filling material
UnW Inc Jts	Unweathered including joints	Rock mass and discontinuities are unweathered; only occasional joints show rusty stain, practically no soil filling

HARDNESS

Descriptive Term	Properties
Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to 1/4 inch deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Moderately soft	Can be grooved or gouges 1/16 inch deep by firm pressure on knife of pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.
Soft	Can be grooved or gouges readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

FIGURE 5

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