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December 5, 2011

Joseph Doherty, AIA
Array Healthcare Facilities Solutions
2520 Renaissance Boulevard, Suite 110
King of Prussia, Pennsylvania 19406

Re: Recommendations for Proposed Behavioral Health Facility
VA Lebanon Medical Center
1700 South Lincoln Avenue, Lebanon, Pennsylvania

Dear Mr. Doherty:

In accordance with our agreement, Dewberry has provided geotechnical consulting services for the VA Lebanon Medical Center Behavioral Health Complex. As part of this project, a two-story building is proposed to be constructed in the southeast portion of the VA property, just east of Parking Lot 1 and west of State Drive. This letter summarizes the results of the subsurface investigation that was performed and recommends design criteria and construction requirements for the proposed Behavioral Health Facility. This letter updates our original letter dated August 22, 2011 to reflect slight shifts in the proposed building's shape, size, location and orientation. In consideration of these changes, there are no material changes to the August 22 findings or recommendations.

On August 9 and August 10, 2011, Borings B-1 through B-5 were drilled in the grass east of the southeast parking lot. These borings were sampled continuously using a 1 3/8 in. I.D. split spoon sampler driven by a 140 lb. automatic hammer with a 30 in. drop (Standard Penetration Test, ASTM D 1586). Soil samples were classified using the Burmister field classification system (ASTM, 1958). Limestone bedrock was encountered in all five borings at depths varying from 3 to 8 ft. Rock was cored in borings B-1, B-2, B-4, and B-5 according to the Standard Practice for Rock Core Drilling, ASTM D 2113-08. See attached Boring Location Plan and Boring Logs. All boring were performed under the full time inspection of an experienced boring inspector from Dewberry.

The subsurface conditions beneath the proposed Behavioral Health Facility consist of brown, soft to very stiff clayey silt overlying shallow limestone bedrock. Standard penetration test N-values in the soil overburden ranged from 3 to 17 and bedrock conditions are summarized in the following table:

Boring & Core	Depth to Bedrock (ft.)	Top of Bedrock Elev. (ft.)	Run (ft.)	Recovery (%)	RQD ¹ (%)
B-1 C-1	3.9	±556.1	5	85	73
B-2 C-1	2.7	±554.8	5	88	32
B-2 C-2	"	"	5	95	72
B-3 ²	7.9	±548.1	-	-	-
B-4 C-1	6.9	±549.6	5	95	83

Boring & Core	Depth to Bedrock (ft.)	Top of Bedrock Elev. (ft.)	Run (ft.)	Recovery (%)	RQD ¹ (%)
B-4 C-2	"	"	5	92	52
B-5 C-1	5.8	545.2	5	83	29

¹ Rock Quality Designation

² No rock core performed. Data based on standard penetration test results.

Groundwater was not encountered above bedrock.

It was reported that karst ground conditions were identified and remediated as part of the adjacent hospital expansion work. Holes of unknown size and extent were encountered during excavation for spread footings 1000+ ft. northwest of the site. Grout was used to fill these holes prior to footing construction. Based on visual inspection of the retrieved rock cores, no evidence of solution cavities was present in any of the cores.

Recommendations

It is recommended that the proposed Behavioral Health Facility be supported on spread footings founded directly or indirectly on bedrock. In the areas where the depth to bedrock increases beyond the desired bottom of footing embedment, overburden soil can be excavated to the top of rock and a concrete filler pour placed to maintain a rock bearing foundation. All footings should have a minimum width of 24 inches and may be designed using an allowable bearing capacity of 3 tsf. No post construction settlement is anticipated.

First floor slabs may be constructed as slabs-on-grade, following thorough compaction of the in situ soils. A value of 50 pci may be used for the subgrade modulus of this compacted material. A vapor barrier installed in accordance with current ACI recommendations should be provided beneath the slab-on-grade areas to minimize the transmission of water vapor through the slab and into the building.

If karst conditions such as voids or other similar subsurface openings are encountered during construction, they should be filled completely with grout and the undersigned should be contacted in order to update these recommendations. Additionally, all excavations which expose bedrock should be sealed prior to any precipitation by either placing concrete for footings, etc., or by making a closure pour of lean concrete if footing construction will be delayed. This will prevent the possible softening and erosion of limestone and the formation of cavities.

Seismic

Since bedrock will be present either immediately beneath or within 10 ft. of the bottoms of footings, a seismic site class of B is recommended for design of this structure.

Groundwater is not expected to be encountered, except that which collects in foundation excavations as a result of precipitation.

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Underground Utilities

An active water main and an abandoned branch of the main crosses the proposed footprint of the new facility. The active line should be relocated out from under the footprint and the abandoned branch should be removed prior to construction of the footings and first floor slab.

Should you have any questions regarding these recommendations, please feel free to contact Gene Schwarzrock at 973-780-9338.

Sincerely,

Dewberry-Goodkind, Inc.



Michael R. Rehberg, P.E.
Chief Geotechnical Engineer

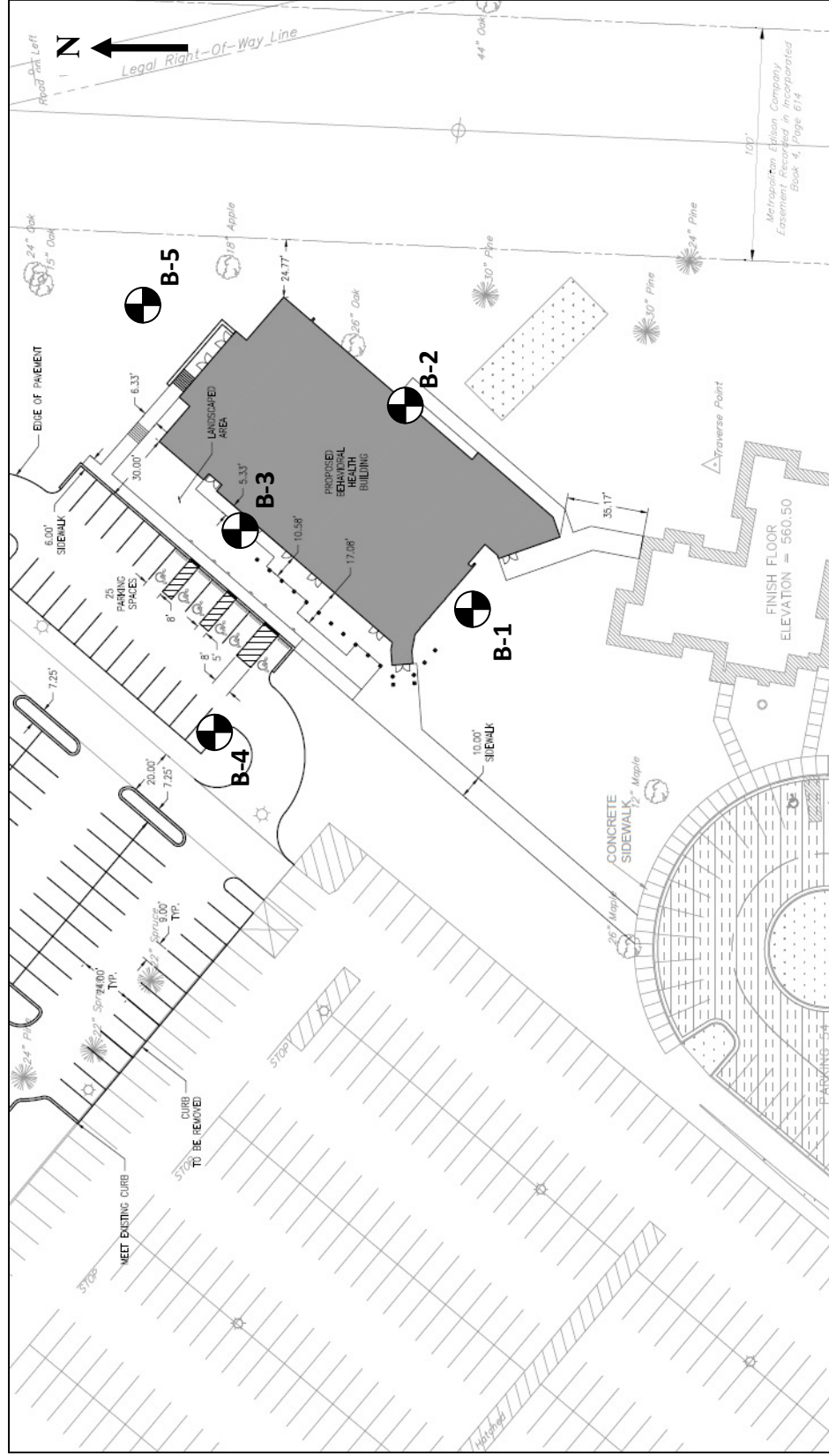


Eugene J. Schwarzrock
Project Geotechnical Engineer

c: Chris Cirrotti - Dewberry

Attachments

C:\Users\eschwarzrock\Desktop\Letter 2011-12-02 Updated Fdn Recomm's.doc



NOTE:

Base plan image provide by Array architects, Dec. 1, 2011

VA LEBANON MEDICAL CENTER
Behavioral Health Facility

BORING LOCATION PLAN

Dewberry-Goodkind, Inc.
200 Broadacres Drive, Suite 410
Bloomfield, New Jersey 07003

SCALE: N.T.S.

DATE: rev. 12-1-2011

ROUTE:		LOCAL NAME: VA Medical Center - Behavioral Health Facility				BORING NO. B-1			
COORDINATES:		Lebanon, PA				FIELD BORING NO.			
STATION:		OFFSET:		REFERENCE LINE:		GROUND ELEVATION: ±560			
BORING BY: Craig Test Boring		DATE STARTED: 8/10/2011				GROUND WATER ELEVATION			
INSPECTOR: J. Agamie		DATE COMPLETED: 8/10/2011				0 Hr. None Date: 24 Hr. Date: ft. P.P. installed			

DEPTH (ft)	CASING BLOWS	SAMPLE NO.	DEPTH			Blows on Spoon			REC. (in)	SOIL DESCRIPTION AND STRATIFICATION	(ft)
						0 / 6	6 / 12	12 / 18			
5	CASING	S1	0	2		1	2		20"	2 in. Gray Clayey SILT; organics	
	↓					4	5			Brown Clayey SILT, trace f Sand	
		S2	2	3.9		2	2		16"	Brown CLAY & SILT, trace(-) f Sand	
						4	100/4			Top of Rock	3.9
		C-1	3.9	8.9				RUN	60"	Gray, hard, moderately fractured, moderately weathered	
10								REC	85%	Limestone	
								RQD	73%		
15											
20											
25											
30											
35											
40											

Nominal I.D. of Casing	4 in.
Nominal I.D. of Split Barrel Sampler	1 ½ in.
Weight/type of Hammer on Drive Pipe	300 lb.
Weight/type of Hammer on Split Barrel	140 lb. Automatic
Drop of Hammer on Drive Pipe	24 in.
Drop of Hammer on Split Barrel	30 in.
Core Size	N

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for the Owner's design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the Owner. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata _____
 Inferred Change in Strata -----

ROUTE:		LOCAL NAME: VA Medical Center - Behavioral Health Facility						BORING NO. B-2			
COORDINATES:		Lebanon, PA						FIELD BORING NO.			
STATION:		OFFSET:		REFERENCE LINE:				GROUND ELEVATION: ±558			
BORING BY: Craig Test Boring		DATE STARTED: 8/10/2011		GROUND WATER ELEVATION 0 Hr. None 24 Hr. Date: ft. P.P. installed Date:							
INSPECTOR: J. Agamie		DATE COMPLETED: 8/10/2011									
DEPTH (ft)	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon			REC. (in)	SOIL DESCRIPTION AND STRATIFICATION	(ft)	
					0 / 6	6 / 12	12 / 18				
5	CASING	S1	0	2	2	2		18"	2 in. Gray Clayey SILT, trace f Sand		
	↓				3	3			Brown Clayey SILT, trace(-) f Sand, trace(-) f Gravel		
		S2	2	2.7	3	100/2		16"	Same; occasional fractured Limestone		
									Top of Rock	2.7	
		C-1	2.7	7.7				RUN	60"	Gray LIMESTONE, hard, intensely fractured, moderately weathered	
10								REC	88%	Gray LIMESTONE, hard, moderately fractured, moderately weathered	
								RQD	32%		
		C-2	7.7	12.7				RUN	60"		
								REC	95%		
15								RQD	72%	Bottom of Hole at 12.7 ft.	
20											
25											
30											
35											
40											

Bottom of Hole at 12.7 ft.

Nominal I.D. of Casing	4 in.
Nominal I.D. of Split Barrel Sampler	1 ½ in.
Weight/type of Hammer on Drive Pipe	300 lb.
Weight/type of Hammer on Split Barrel	140 lb. Automatic
Drop of Hammer on Drive Pipe	24 in.
Drop of Hammer on Split Barrel	30 in.
Core Size	N

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

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Approximate Change in Strata _____
Inferred Change in Strata -----

ROUTE:		LOCAL NAME: VA Medical Center - Behavioral Health Facility				BORING NO. B-3			
COORDINATES:		Lebanon, PA				FIELD BORING NO.			
STATION:		OFFSET:		REFERENCE LINE:		GROUND ELEVATION: ±556			
BORING BY: Craig Test Boring		DATE STARTED: 8/10/2011				GROUND WATER ELEVATION			
INSPECTOR: J. Agamie		DATE COMPLETED: 8/10/2011				0 Hr. None Date: 24 Hr. Date: ft. P.P. installed			
DEPTH (ft)	CASING BLOWS	SAMPLE NO.	Blows on Spoon			REC. (in)	SOIL DESCRIPTION AND STRATIFICATION	(ft)	
			0 / 6	6 / 12	12 / 18				
5		S1	0	2	1	2	14"	2 in. Gray Clayey SILT; organics	
					2	3		Brown Clayey SILT, trace(-) f Sand	
		S2	2	4	1	2	10"	SAME	
					1	1			
		S3	4	6	1	2	13"	Brown CLAY & SILT, trace(-) f Sand	
10					5	4			
		S4	6	7.9	1	2	16"	SAME; piece of Limestone in tip	
					4	100/4			7.9
								Bottom of Hole at 7.9 ft.	
15									
20									
25									
30									
35									
40									

Nominal I.D. of Casing	4 in.
Nominal I.D. of Split Barrel Sampler	1 ¾ in.
Weight/type of Hammer on Drive Pipe	300 lb.
Weight/type of Hammer on Split Barrel	140 lb. Automatic
Drop of Hammer on Drive Pipe	24 in.
Drop of Hammer on Split Barrel	30 in.
Core Size	N

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

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Approximate Change in Strata _____
 Inferred Change in Strata -----

ROUTE:		LOCAL NAME: VA Medical Center - Behavioral Health Facility						BORING NO. B-4		
COORDINATES:		Lebanon, PA						FIELD BORING NO.		
STATION:		OFFSET:		REFERENCE LINE:				GROUND ELEVATION: ±556		
BORING BY: Craig Test Boring		DATE STARTED: 8/9/2011		GROUND WATER ELEVATION 0 Hr. None 24 Hr. Date: ft. P.P. installed Date:						
INSPECTOR: J. Agamie		DATE COMPLETED: 8/9/2011								
DEPTH (ft)	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon			REC. (in)	SOIL DESCRIPTION AND STRATIFICATION	(ft)
					0 / 6	6 / 12	12 / 18			
5	CASING	S1	0	2	2	3		17"	2 in. Gray Clayey SILT, trace(-) f Sand Brown Clayey SILT, trace(-) f Sand SAME SAME	
	↓				4	5				
		S2	2	4	3	4		16"		
					6	7				
		S3	4	6	3	8		22"		
10					9	9			Brown-gray Clayey SILT, trace(-) f Sand Top of Rock	
		S4	6	6.9	9	100/4		16"		
										6.9
15		C-1	6.9	11.9			RUN	60"	Gray LIMESTONE, intensely to moderately fractured, hard, moderately weathered	
							REC	95%		
							RQD	83%		
20									SAME	
		C-2	11.9	16.9			RUN	60"		
							REC	92%		
25							RQD	52%	Bottom of Hole at 16.9 ft.	
30										
35										
40										

Bottom of Hole at 16.9 ft.

Nominal I.D. of Casing	4 in.
Nominal I.D. of Split Barrel Sampler	1 ¾ in.
Weight/type of Hammer on Drive Pipe	300 lb.
Weight/type of Hammer on Split Barrel	140 lb. Automatic
Drop of Hammer on Drive Pipe	24 in.
Drop of Hammer on Split Barrel	30 in.
Core Size	N

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Approximate Change in Strata

Inferred Change in Strata

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ROUTE:		LOCAL NAME: VA Medical Center - Behavioral Health Facility						BORING NO. B-5		
COORDINATES:		Lebanon, PA						FIELD BORING NO.		
STATION:		OFFSET:		REFERENCE LINE:				GROUND ELEVATION: ±551.5		
BORING BY: Craig Test Boring		DATE STARTED: 8/9/2011		GROUND WATER ELEVATION 0 Hr. None 24 Hr. Date: ft. P.P. installed Date:						
INSPECTOR: J. Agamie		DATE COMPLETED: 8/9/2011								
DEPTH (ft)	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon			REC. (in)	SOIL DESCRIPTION AND STRATIFICATION	(ft)
					0 / 6	6 / 12	12 / 18			
5	CASING	S1	0	2	1	2		20"	2 in. Gray Clayey SILT Brown Clayey SILT, trace(-) f Sand; occasional stone fragment SAME Brown-gray Clayey SILT, trace(-) f Sand Top of Rock	5.8
	↓				4	6				
		S2	2	4	5	7		15"		
					8	7				
		S3	4	5.8	2	3		14"		
10					4	100/4			Gray LIMESTONE, intensely fractured, hard, moderately weathered	10.8
		C-1	5.8	10.8			RUN	60"		
							REC	83%		
							RQD	29%		
15									Bottom of Hole at 10.8 ft.	
20										
25										
30										
35										
40										

Nominal I.D. of Casing	4 in.
Nominal I.D. of Split Barrel Sampler	1 ½ in.
Weight/type of Hammer on Drive Pipe	300 lb.
Weight/type of Hammer on Split Barrel	140 lb. Automatic
Drop of Hammer on Drive Pipe	24 in.
Drop of Hammer on Split Barrel	30 in.
Core Size	N

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

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Approximate Change in Strata _____
Inferred Change in Strata