GeoDesign Inc
An NV5 Company

Addendum Transmittal

To:	Amanda Blackburn	From:	Nick Paveglio George Saunders
Company:	West Linn-Wilsonville School District	Date:	July 27, 2020
Address:	c/o CBRE Heery, Inc. 2 Centerpointe Drive, Suite 250 Lake Oswego, OR 97035		

cc:	Peder Goldberg, JG Pierson, Inc. (via email only) John Howorth, 3J Consulting, Inc. (via email only)

GDI Project:	WLWSchDist-2-01
RE:	West Linn Stadium Expansion

Original File Name	Date	Document Title
WLWSchDist-2-01-071420-geor	7/14/20	Report of Geotechnical Engineering Services; West Linn Stadium Expansion; 5464 West A Street; West Linn, Oregon

Addendum Number	Date	Description
1	7/27/20	Micropile Recommendations (attached)

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Attachment

One copy submitted (via email only)

Document ID: WLWSchDist-2-01-072720-geoat-1.docx

GeoDesign Inc
An NV5 Company

July 27, 2020

West Linn-Wilsonville School District
c/o CBRE Heery, Inc.
2 Centerpointe Drive, Suite 250
Lake Oswego, OR 97035

Attention: Amanda Blackburn

Addendum 1
Micropile Recommendations
West Linn Stadium Expansion
5464 West A Street
West Linn, Oregon
GeoDesign Project: WLWSchDist-2-01

INTRODUCTION

This addendum provides micropile recommendations for the stadium expansion project at West Linn High School located at 5464 West A Street in West Linn, Oregon. GeoDesign prepared a geotechnical report for the project dated July 14, 2020.[1]

MICROPILE RECOMMENDATIONS

Micropiles extending into basalt present between 2 and 4.5 feet below ground surface can be used to support compression and uplift loading of the stadium expansion. We recommend a minimum embedment of 10 feet into the underlying basalt bedrock and an unbonded length of at least 5 feet. A design-build contractor should be responsible for selecting the length and appropriate design skin friction to achieve the capacity specified by the structural engineer. For cost estimating purposes, ultimate bond strengths between 10 and 30 kips per square foot are anticipated in basalt. A factor of safety of 2 is typical for compressive loads and 1.5 is typical for short-term tensile loads if the micropiles are load tested to confirm their capacity. A factor of safety of 2 is typical for long-term tensile loads. Micropiles should be spaced at least 30 inches apart or 3 micropile diameters, whichever is greater. Micropiles extending into basalt will have negligible settlement beyond elastic compression of element.

[1] GeoDesign, Inc., 2020. *Report of Geotechnical Engineering Services; West Linn Stadium Expansion; 5464 West A Street; West Linn, Oregon,* dated July 14, 2020. GeoDesign Project: WLWSchDist-2-01

A testing program should be implemented to verify the capacity of the micropile design. We recommend that at least one verification test to 200 percent of the design load be completed at the north and south expansion areas. We recommend that 10 percent of the remaining micropiles be tested during production. All testing should be completed in accordance with the procedures in ASTM D3689. If testing indicates variability in micropile capacity, it may be necessary to test more than 10 percent of the production micropiles.

Resistance to lateral loads can be developed by passive pressure on the face of buried foundation elements as described in the report. Lateral resistance can also be developed from embedded portions of the micropiles. Soil and rock parameters for use in the program LPILE are provided in Table 1.

Table 1. Recommended LPILE Input Parameters for Deep Foundations

Depth (feet)	Soil Type	Soil Model	Effective Unit Weight (pcf)	Undrained Shear Strength (psf)	E50	Uniaxial Compressive Strength, qu (psi)
0 to 4.5	Overburden Soil	Soft Clay	110	750	0.01	NA
4.5 to 50	Medium Hard to Hard Basalt	Strong Rock	150	-	-	4,000

NA: not applicable
pcf: pounds per cubic foot
psf: pounds per square foot
psi: pounds per square inch

Group action should be considered if deep foundation spacing in the direction of loading is less than 8 pile diameters on-center. The lateral forces should be reduced in accordance with the values provided in Table 2. Reduction is not required for piles on the leading edge of translation.

Table 2. Lateral Capacity Reduction Factors

Shaft Center-to-Center Spacing (in the direction of loading)	P-Multiplier		
	Row 1	Row 2	Row 3
2.0B	0.60	0.35	0.25
3.0B	0.75	0.40	0.40
5.0B	1.00	0.85	0.70
7.0B	1.00	1.00	0.90

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We appreciate the opportunity to be of service to you. Please call if you have questions concerning this addendum or if we can provide additional services.

Sincerely,

GeoDesign, Inc.

Nick Paveglio, P.E.
Senior Associate Engineer

George Saunders, P.E., G.E.
Principal Engineer

cc: Peder Goldberg, JG Pierson, Inc. (via email only)
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