

# TERRA ASSOCIATES, Inc.

Consultants in Geotechnical Engineering, Geology  
and  
Environmental Earth Sciences

January 15, 2024  
Project No. T-5915-3

Mr. Stephen Nornes  
Presbyterian Homes & Services and Senior Housing Partners  
2823 Hamline Avenue North  
Roseville, Minnesota 55113

Subject: Response to Comments  
Wesley Homes Senior Living Expansion – Phase 2  
Puyallup, Washington

Reference: Geotechnical Peer Review Letter, Wesley Homes Senior Living Expansion – Phase 2, Civil Construction Permit No. PRCCP20231028-CV1, Puyallup, Washington, Project No. 2124006.010, prepared by Landau Associates, dated December 5, 2023

Dear Mr. Nornes:

As requested we have reviewed additional comments from the City of Puyallup regarding slope stability at the location of the Care Center building for the subject project. The comments were provided in the referenced Peer Review letter by Landau Associates. The following summarizes our response and provides the additional information requested in the order of the bulleted comments listed on page 2 of the referenced letter.

First Comment - *Terra Associates' geotechnical engineering letter includes a seismic stability analysis cross section for the proposed building and the slope that supports it at the northwest area of the parcel. The seismic stability analysis result shows a factor of safety less than 1.2 for dynamic conditions. Additional dynamic analysis completed by Terra Associates resulted in lateral slope displacements of less than 2 inches along the edge of the proposed building and less than one-half-inch towards the mid-point of the structure. Per Section 21.06.1230 (2) (A) of the PMC, proposed development shall not decrease the factor of safety for landslide occurrence below the limits of 1.5 for static conditions and 1.2 for dynamic conditions. This is a basic development design standard that must be met per the PMC, unless it can be demonstrated that an alternative design that deviates from this design standard provides greater long-term slope stability while meeting all other provisions of Chapter 21.06.*

Response – Subsequent issuance of our May 22, 2023 comment response letter, we completed additional stability analysis to evaluate the effectiveness of supporting the western half of the Care Center building on pipe piles as recommended if the owner was not willing to accept risk of building displacements as a result of dynamic loading during a design level earthquake. The results of this analysis was summarized in a letter we issued on June 13, 2023. It appears that Landau did not have this information as the letter is not listed as a document they reviewed. The June 13 letter is attached for reference and provides the requested information that demonstrates the required minimum seismic safety factor of 1.2 is met with the western portion of the building supported on pipe piles.

Mr. Stephen Nornes  
May 22, 2023

Second Comment - *Per Section 21.06.1230 (2) (B) of the PMC, the alteration shall not increase the threat of geological hazard to the project site or adjacent properties beyond predevelopment conditions, nor shall it result in a need for increased buffers on neighboring properties. In its geotechnical engineering letter, Terra Associates provides seismic stability analysis resulting in a factor of safety of 0.975, and states that the proposed development will actually decrease the potential for slope movements than what currently exists. To be in accordance with the PMC, Terra Associates should provide a pseudo-static slope stability analysis of the current existing slope for comparison.*

Response - This analysis had been completed, however, was not included with any of the previous submissions and responses. Results of the seismic stability analysis of the existing conditions from the SLIDE2 computer program published by RocScience is attached. The lowest indicated safety factor under seismic loading for the existing condition was .908.

Third Comment - *Per Section 21.06.1230 (11) of the PMC, a monitoring program shall be prepared and implemented for construction activities permitted in landslide and erosion hazard areas. In its geotechnical engineering letter, Terra Associates recommends adding a note to the project drawings specifying bi-weekly slope reconnaissance during construction and quarterly slope reconnaissance post building construction. To be in accordance with the PMC, a slope monitoring plan should be included in the project documents and approved by the owner.*

Response – We understand that our recommendations for slope monitoring as outlined in our May 22, 2023 response letter will be included with the civil drawings as approved by the owner.

Fourth Comment - *In its Geotechnical Report Addendum Response to Comments letter, Terra Associates recommends Rammed Aggregate Piers (RAPs) for mitigating unsuitable fill soils, however the extent of RAPs required is unclear. If RAPs are to be used, a recommended minimum replacement ratio to achieve suitable foundation support and/or site slope stability should be provided. Terra Associates should specify performance criteria for design of RAPs for slope stability improvement.*

Response – As noted earlier, the western half of the building will be supported by Pipe Piles as recommended in our attached June 13, 2023 letter. Ground improvement using Rammed Aggregate Piers (RAPs) will not be used.

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

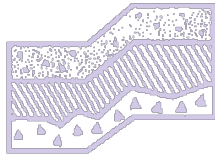
Sincerely yours,  
**TERRA ASSOCIATES, INC.**

Theodore J. Schepper

Theodore J. Schepper, P.E. 1-15-24  
Senior Principal Engineer

Cc: Ms. Jill Krance, In Site Architects  
Mr. Dan Balmelli, P.E., Barghausen Consulting Engineers

Attachments: Terra Associates, Inc. June 13, 2023 Letter  
SLIDE2 Seismic Stability Analysis Results for Existing Conditions



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Consultants in Geotechnical Engineering, Geology  
and  
Environmental Earth Sciences

June 13, 2023  
Project No. T-5915-3

Mr. Stephen Nornes  
Presbyterian Homes & Services and Senior Housing Partners  
2823 Hamline Avenue North  
Roseville, Minnesota 55113

Subject: Care Center Foundation Support Alternative  
Wesley Homes Expansion  
Puyallup, Washington

Reference: Response to Comments, Geotechnical Report Addendum, Wesley Homes Expansion, Puyallup  
Washington, Project No. T-5915-3, prepared by Terra Associates, Inc., dated May 22, 2023

Geotechnical Report Addendum, Wesley Homes Expansion, Puyallup, Washington, Project No.  
T-5915-3, prepared by Terra Associates, Inc., dated December 29, 2022

Geotechnical Report, Wesley Homes Puyallup, 39<sup>th</sup> Avenue SE, Puyallup, Washington, Project  
No. T-5915-3, prepared by Terra Associates, Inc., revised date November 14, 2016

Dear Mr. Nornes:

Pursuant your request we have completed additional slope stability analysis for the northern Care Center building. As discussed in the referenced Response to Comments letter, stability analysis indicated that safety factors against slope failures under Psuedostatic (seismic) loading were less than the City of Puyallup Municipal Code (PMC) 1.2 minimum requirement. The purpose of this analysis was to determine what portion of the building would require pile support in order to meet the PMC minimum requirement.

As before our analysis was completed using the SLIDE2 computer program published by RocScience. Results of the analysis indicate that pile supported foundations would be required in the western approximately 50 feet of the building. This is shown on the attached site plan Figure 1. A graphic of the cross section showing the failure surface with the minimum safety factor along with soil parameters used in the analysis is attached as Figure 2.

Design recommendations for supporting the building on four-inch diameter driven pipe pile are provided in the referenced November 14, 2016 geotechnical report. These recommendations continue to remain valid for project design.

Mr. Stephen Nornes  
June 13, 2023

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,  
**TERRA ASSOCIATES, INC.**

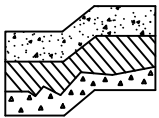
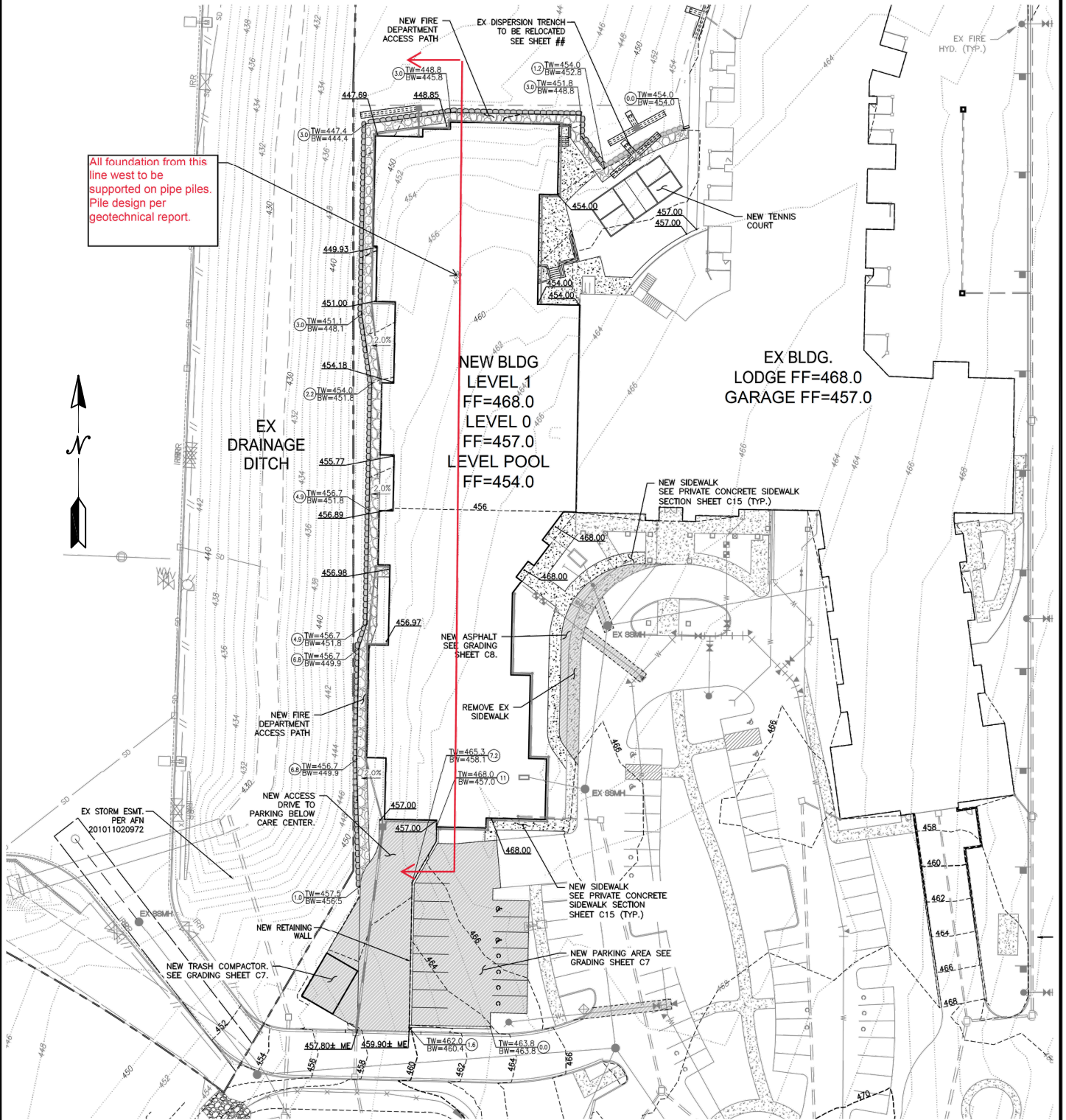
*Theodore J. Schepper*

Theodore J. Schepper, P.E. 6-13-23  
Senior Principal Engineer

Cc: Ms. Jill Krance, In Site Architects

Attachments: Figure 1 – Pile Supported Foundation Area Building Site Plan  
Figures 2 – SLIDE2 Stability Analysis Results

FOR  
**PHASE 2 - WESLEY BRADLEY PARK**



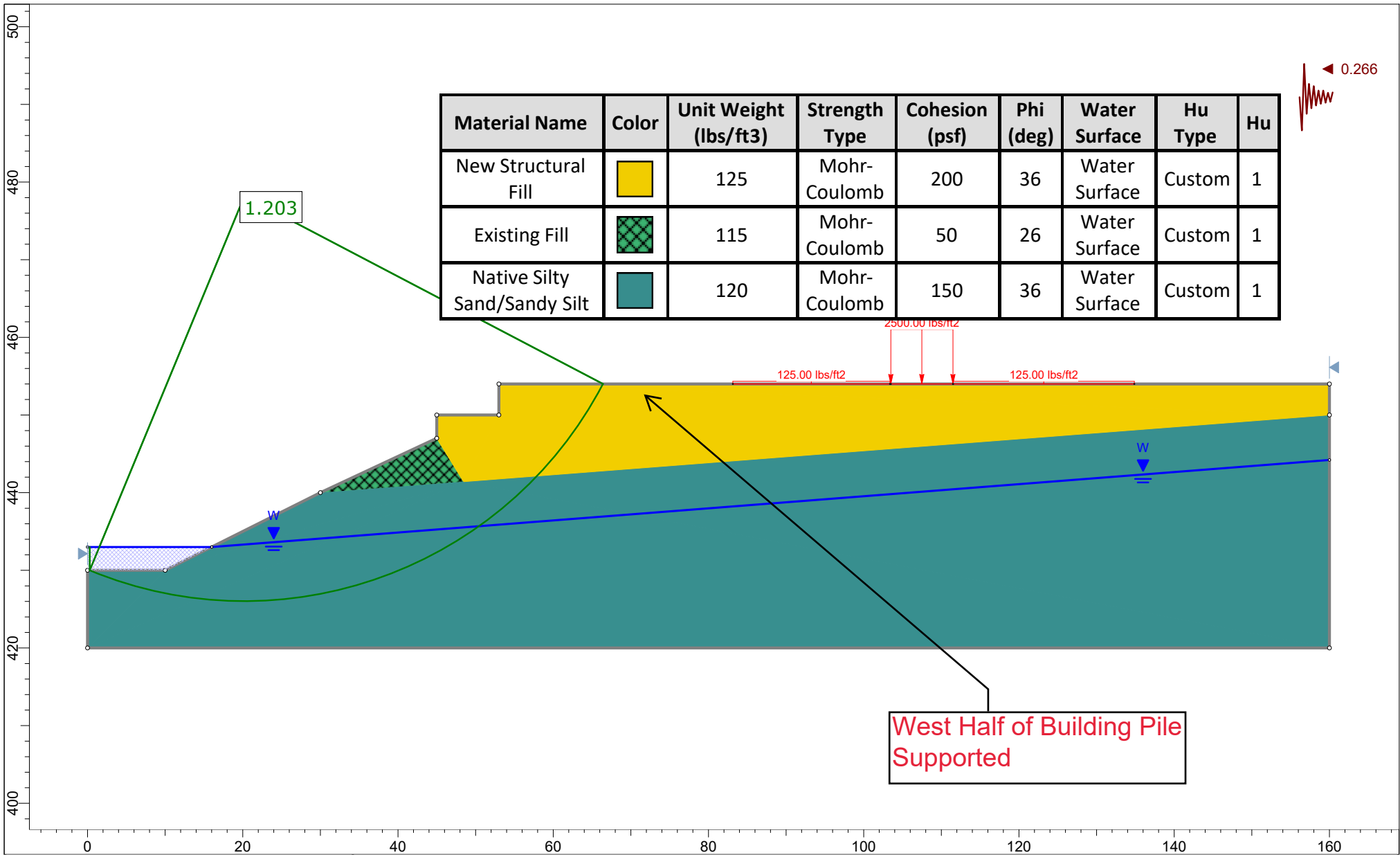
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**BUILDING SITE PLAN PILE SUPPORT AREA  
CARE CENTER WESLEY BRADLEY PARK  
PUYALLUP, WASHINGTON**

Proj. No.T-5915-3

Date JUNE 2023

Figure 1

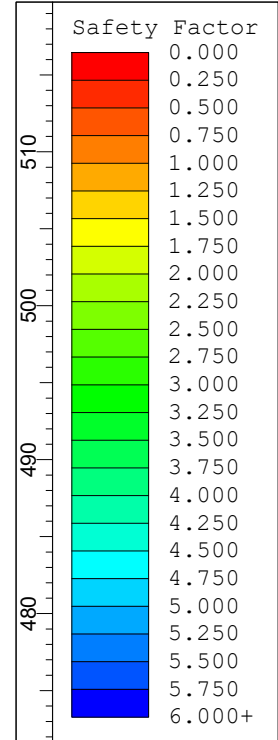


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
New Structural Fill		125	Mohr-Coulomb	200	36	Water Surface	Custom	1
Existing Fill		115	Mohr-Coulomb	50	26	Water Surface	Custom	1
Native Silty Sand/Sandy Silt		120	Mohr-Coulomb	150	36	Water Surface	Custom	1



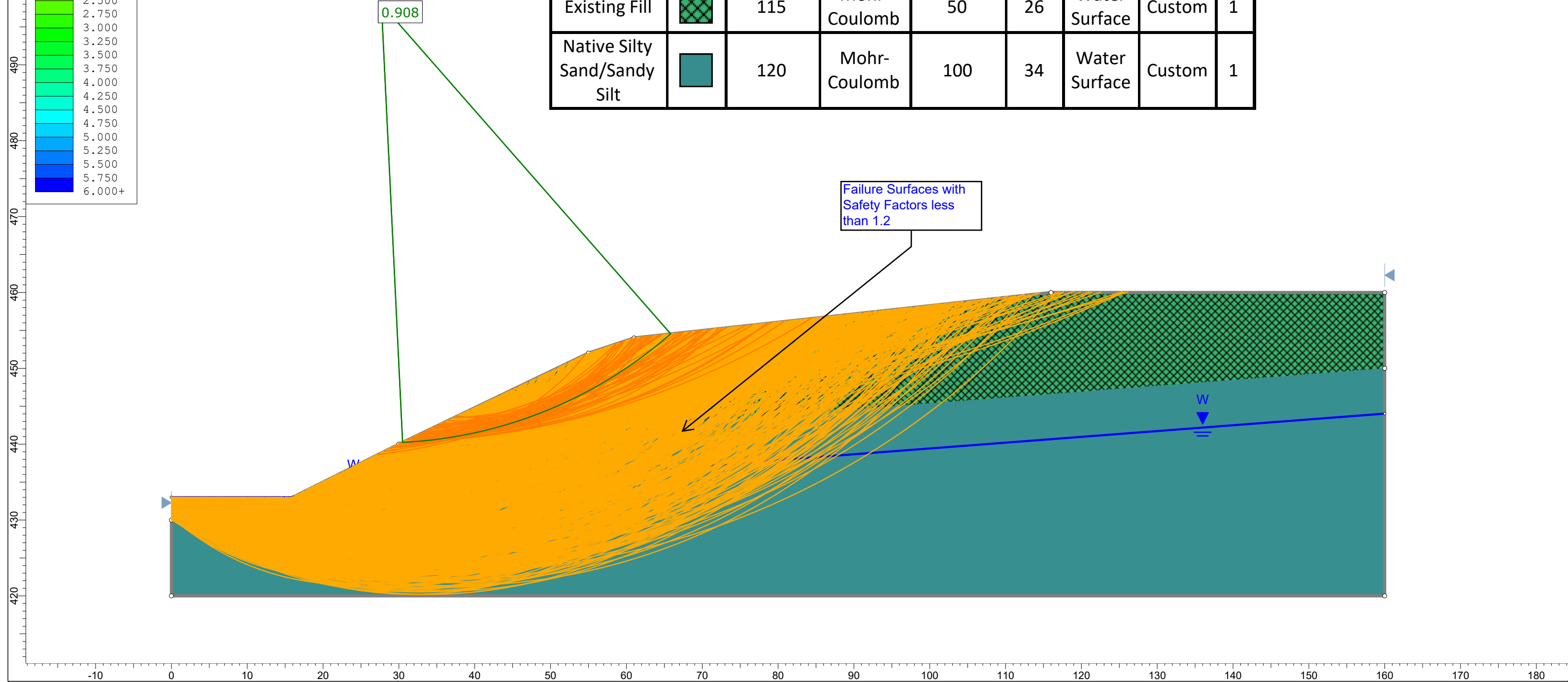
SLIDEINTERPRET 9.008

Project		SLIDE - An Interactive Slope Stability Program	
Group	Group 1	Scenario	Master Scenario
Drawn By		Company	Terra Associates, Inc.
Date	5/16/2023, 9:57:40 AM	File Name	Care Center Section A-A' Built Condition Seismic West Pile Supported.slmd



0.266

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Existing Fill		115	Mohr-Coulomb	50	26	Water Surface	Custom	1
Native Silty Sand/Sandy Silt		120	Mohr-Coulomb	100	34	Water Surface	Custom	1



SLIDEINTERPRET 9.008

Project		SLIDE - An Interactive Slope Stability Program	
Group	Group 1	Scenario	Master Scenario
Drawn By		Company	Terra Associates, Inc.
Date	5/16/2023, 11:31:28 AM	File Name	Care Center Section A-A' Existing Conditions Seismic Analysis