GEOTECHNICAL REPORT

Allen Short Plat
6232 Northeast 137th Street
Kirkland, Washington

Project No. T-8603

Terra Associates, Inc.

Prepared for:

Allen IKS Properties, LLC
Kirkland, Washington

September 2, 2021

TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

September 2, 2021
Project No. T-8603

Mr. Brian Allen
Allen IKS Properties, LLC
6232 Northeast 137th Street
Kirkland, Washington 98034

Subject: Geotechnical Report
Allen Short Plat
6232 Northeast 137th Street
Kirkland, Washington

Dear Mr. Allen:

As requested, we conducted a geotechnical engineering study for the subject project. The attached report presents our findings and recommendations for the geotechnical aspects of project design and construction.

Site soils consist of variably thick layers of Advance outwash silty sand and sand. Upper weathered horizons of the outwash soils are loose to medium dense, with relative densities increasing with depth to dense and very dense. No groundwater was observed during drilling of the test borings.

In our opinion, there are no geotechnical conditions that would preclude the planned site development. The residences can be supported on conventional spread footings bearing on competent native soils or on structural fill placed on competent native soils. Floor slabs can be similarly supported.

Detailed recommendations addressing these issues and other geotechnical design considerations are presented in the attached report. 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.

CAROLYN S. DECKER
47016

9-2-2021

Carolyn S. Decker, P.E.
President

cc: Mr. Craig Krueger, CORE Design

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1.0 PROJECT DESCRIPTION

We were provided Sheet 1 of 1 titled "Allen Property, Conceptual Site Plan," dated May 19, 2021, prepared by CORE Design. The project consists of subdividing the site into four lots for individual single-family residence construction.

Building and grading plans for the project are currently unavailable for review. Building footprint locations shown on the conceptual site plan indicate that at the two northern lots, lower-level building construction will likely daylight to the south and southwest, resulting in cut depths ranging to a maximum of about ten feet for lower-level construction. The two southern residences will be constructed on relatively level to gently sloping ground. We expect that single and/or tiered retaining walls will accommodate vertical grade changes at the site. Project stormwater runoff will be directed to a 1,600 square foot stormwater detention vault located at "Tract A" at the southwestern portion of the site.

We anticipate the structures will be two- to- three-story, wood-framed buildings. Foundation loads should be light, in the range of 3 to 4 kips per foot for bearing walls and 50 to 75 kips for isolated columns.

The recommendations contained in the following sections of this report are based on our understanding of the above design features. We should review design drawings as they become available to verify our recommendations have been properly interpreted and incorporated into project design and to amend or supplement our recommendations, if required.

2.0 SCOPE OF WORK

We explored subsurface conditions at the site by observing conditions in three test borings drilled to depths of 31.5, 41.5, and 46.5 feet below existing surface grades using a tracked hollow-stem auger drill rig. Based on the results of our field study, laboratory testing, and analyses, we developed geotechnical recommendations for project design and construction. Specifically, this report addresses the following:

- Soil and groundwater conditions.
- Geologic hazards per the current City of Kirkland Zoning Code (KZC).
- Seismic site class per the current International Building Code (IBC).
- Site preparation and grading.
- Foundation support.
- Slab-on-grade floors.

- Retaining walls.
- Infiltration feasibility.
- Stormwater detention vault.
- Drainage.
- Utilities.

It should be noted, recommendations outlined in this report regarding drainage are associated with soil strength, design earth structure pressures, erosion, and stability. Design and performance issues with respect to moisture as it relates to the building environment is beyond Terra Associates, Inc.'s purview. A building envelope specialist or contractor should be consulted to address these issues, as needed.

3.0 SITE CONDITIONS

3.1 Surface

The project site consists of two tax parcels totaling approximately one-acre of land located at 6232 Northeast 137th Street in Kirkland, Washington. The approximate site location is shown on Figure 1.

An existing two-story residence with a detached garage is located at the central portion of the site. A sport court lies within the site's southwestern area. An asphalt driveway extends northeastward from the terminus of Northeast 137th Street to a level graveled parking area adjacent to the detached garage. Level lawn areas are also located south and west of the residence.

Beyond the level developed areas, site topography consists of south-facing, variably inclined slopes that have a total overall relief of approximately 50 feet. Ten-foot to 14-foot tall (maximum) slopes are located at the site's northwestern, southwestern, and southeastern property boundaries. These slopes are inclined between approximately 80 and 130 percent. We observed evidence of past soil movements at the site's northeastern area. The soil slump is an arcuate feature with a two- to three-foot high exposed scarp visible along its approximate 50-foot length. The ground surface downslope of the scarp is uniform and no back-rotation of the ground surface or tilting of trees is shown. A 30-inch cedar tree is growing on the scarp indicating the movements likely pre-date establishment of second growth trees in the area. The approximate location of the slump is shown on Figure 2.

Except for the northeastern soil slump, our reconnaissance of the site's slopes revealed no indications of instability, such as sloughing, tension cracks, soil slumps, erosion, or seeps on the slope faces. Similarly, our observations of adjacent properties as viewed from the subject site revealed none of the above indications of slope instability.

Site vegetation mainly consists of brush and scattered mature conifers and deciduous trees. Lawn and landscaping shrubs comprise vegetation adjacent to and south of the residence.

3.2 Soils

The soils observed in our borings generally consist of four to six inches of topsoil overlying Older sand (Advance outwash) soils found to the total depths of each boring. Advance outwash silty sand was observed in each boring to depths of 12 to 18 feet. The upper silty sands are generally medium dense to dense, with loose soils found to a depth of seven feet at the location of Test Boring B-3.

Variably thick layers of Advance outwash soils composed of sand, silty sand, and sand with silt underlie the upper silty sands at each boring location. These soils are medium dense to dense to the total depths of Test Boring B-1 and B-2. Very dense sand soils were found below a depth of 33 feet at Test Boring B-3.

The *Preliminary Geologic Map of Seattle and Vicinity, Washington,* by H.H. Waldron et al (1961) shows the site soils mapped as Older sand (Qos), currently known in geological literature as Vashon Advance outwash (Qva). The soils observed in the test borings correlate with the published description of this soil unit.

Detailed descriptions of the subsurface conditions we observed in the test borings are presented on the Test Boring Logs in Appendix A. The approximate locations of the test borings are shown on Figure 2.

3.3 Groundwater

No groundwater was observed during drilling of the test borings. In addition, we observed no mottling of soils during drilling that would indicate development of seasonal fluctuating groundwater levels at the site.

3.4 Geologic Hazards

We evaluated site conditions for the presence of "Geologically Hazardous Areas" as defined in Chapter 85 of the Kirkland Zoning Code (KZC). Discussions related to erosion, landslide, and seismic hazards are given below.

3.4.1 Erosion Hazard Areas

Chapter 85.10. of the KZC defines Erosion Hazard Areas as "Those areas containing soils which, according to the United States Department of Agriculture (USDA) Natural Resource Conservation Services (NRCS) Web Soil Survey, may experience severe to very severe erosion hazard."

The NRCS has mapped the site soils as *Kitsap silt loam, 15 to 30 percent slopes* (KpD). The erosion hazard of this soil type is described as severe. Accordingly, the site contains Erosion Hazard Areas as defined by KZC.

The site soils will be susceptible to erosion when exposed during construction. In our opinion, proper implementation, and maintenance of Best Management Practices (BMPs) for erosion prevention and sedimentation control will adequately mitigate the erosion potential in the planned development area. Erosion protection measures as required by the City of Kirkland will need to be in place prior to and during grading activity on the site.

3.4.2 Landslide Hazard Areas and Relative Slope Stability Analyses

Landslide Hazard Areas are defined in Chapter 85.10. of the KZC as "Areas at risk of mass movement due to a combination of geologic, topographic, and hydrologic factors. Includes high and moderate landslide hazard areas." City of Kirkland GIS Environment mapping published on their Interactive Mapping Portal website shows "Moderate" and "High" Landslide Hazard Areas mapped at the site, and within 100 feet at each of the properties bordering the site. Based on the mapping and as defined by KZC, the site contains landslide hazard areas.

LIDAR imagery shows the above-described arcuate feature located in the northeastern part of the site. No arcuate features or hummocky terrain indicative of slope instability are shown on LIDAR image at the northwestern, southwestern, and southeastern Landslide Hazard Area locations on or adjacent to the site. The LIDAR Image is attached as Figure 3.

We performed preliminary slope stability analyses at the northwestern, southwestern, and southeastern landslide hazard areas at cross-section locations A-A, B-B, and C-C, respectively. The purpose of our preliminary analyses is to determine the relative stability of the slopes in their current and post-construction configurations. Note that the after-construction cases are based on the footprint locations of the residences and southern detention vault shown on the site plan, as well as assumptions stated below. Plans showing design features that will likely affect slope stability, such as finish grades, building and detention vault floor elevations, and the vault's peak storage level are unavailable for review. We should review project plans as they are developed to complete the during-construction analysis case required by City of Kirkland, and to revise our post-construction analyses as needed.

The northwestern analysis (A-A section) for the post-construction case assumes the building will have its floor constructed as cut below existing grades at an elevation matching western slope surface grade. A building footing surcharge load of 2,500 pounds per square foot (psf) and a traffic surcharge value of 250 psf were included in post-construction analyses. The stormwater vault was assumed to store 5 feet of water at peak storage level.

The analyses were completed using the computer program SLIDE v.7.023, published by RocScience, Inc. The cross-section locations, A-A, and B-B, and C-C are shown on Figure 2. The analyses incorporated both static and seismic loading conditions. A horizontal acceleration value of 0.28g was used in the pseudostatic (seismic) analysis to simulate slope performance under earthquake loading. As required by the City of Kirkland, the acceleration value is one-half of the peak horizontal ground acceleration for an earthquake with a two (2) percent in 50-year probability of exceedance. For the after-construction analysis, we have assumed the new residences' lower-floor elevations will match grades at their downslope perimeters.

Based on our field exploration, laboratory testing, and previous experience with similar soil types, we chose the following parameters for our analysis:

Table 1 – Slope Stability Analysis Soil Parameters

Soil Type	Unit Weight (pcf)	Friction Angle (Degrees)	Cohesion (psf)
Medium dense Silty SAND/SAND with Silt	120	34	25
Medium dense silty SAND	120	34	50
Dense SAND/SAND with silt	125	36	0
Very dense SAND	130	38	0

The results of our slope stability analysis, as shown by the lowest safety factors for each condition, are presented in the following table:

Table 2 – Preliminary Slope Stability Analysis Results

Loading Conditions Analyzed	Minimum Safety Factors					
	A-A Section		B-B Section		C-C Section	
	Existing Slope	After Construction	Existing Slope	After Construction	Existing Slope	After Construction
Static Loading	1.56	1.91	1.27	1.78	1.89	1.89
Pseudo-static (Seismic) Loading	0.94	1.22	0.81	1.22	1.12	1.12

Graphical printouts of the analyses are attached in Appendix B.

Northwestern Landslide Hazard Area

Stability analyses of the northwestern slope indicate that according to geotechnical engineering practice (minimum Factor of Safety (FS) = 1.5 for static, minimum FS = 1.1 for seismic), the existing slope is currently stable under static loading conditions, but ground motions from the design earthquake could mobilize the soils. For the post-construction case, preliminary analysis indicates the residence's western foundation would need to be lowered to Elevation 160 or lower to increase safety factors to acceptable levels and protect the residence, adjacent Landslide Hazard Area, and adjacent property from potential soil instability.

Southeastern and Southwestern Landslide Hazard Areas

Based on the above preliminary results, analysis of the southeastern Landslide Hazard Area (C-C Section) indicates the existing slope is currently stable under both static and seismic loading conditions. Though planned driveway construction would reduce the traffic surcharge distance from the slope crest, the surcharge distance reduction would not decrease the stability of the southeastern slope.

Stability analyses at the B-B Section location indicate the southwestern slope below the sport court is currently marginally stable under static loading and could experience soil movements during the design earthquake. As shown by the post-construction case, acceptable safety factors can be achieved with a vault floor constructed no higher than Elevation 136. In general, vault construction is expected to decrease the net load on the slope and transfer vault foundation loads below the potential failure plane.

Based on the above preliminary results, the project can be undertaken safely from a geotechnical standpoint in our opinion. Moreover, provided our recommendations are followed during design and construction, the project will not increase the potential for soil instability at the site or adjacent properties during and after construction.

3.4.3 Seismic Hazard Areas

Chapter 85.10. of the KZC defines Seismic Hazard Areas as "Those areas subject to severe risk of earthquake damage as a result of seismically induced ground shaking, slope failure, settlement or soil liquefaction, which typically occurs in areas underlain by cohesionless soils of low density usually in association with a shallow groundwater table."

A review of the map *Faults and Earthquakes in Washington State* dated 2014 by Jessica L. Czajkowski and Jeffrey D. Bowman shows the nearest fault is categorized as "Class B," and is located approximately 3 miles west of the site. Accordingly, the risk of ground rupture during a seismic event along a fault line at the site is low.

The City of Kirkland GIS Environment mapping shows no areas of Liquefaction Potential mapped at the site. Based on the presence of glacially consolidated soils and the absence of groundwater, it is our opinion that the risk for damage resulting from settlement, lateral spreading, surface failure, or soil liquefaction is negligible. A discussion regarding potential slope soil movements under seismic loading is given above. In our opinion, unusual seismic hazard areas do not exist at the site, and design in accordance with local building codes for determining seismic forces would adequately mitigate impacts associated with ground shaking.

3.5 Seismic Site Class

Based on the site soil conditions and our knowledge of the area geology, per the 2018 International Building Code (IBC), site class "D" should be used in structural design.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 General

Based on our study, there are no geotechnical conditions that would preclude construction of the residences as planned. In general, the residences can be supported on conventional spread footings bearing on competent native soils or on structural fill placed on the competent native soils. Floor slabs can be similarly supported.

The development includes construction of the northeastern residence at the location of the observed slope movements. These soil movements appeared to have involved the upper loose silty sand layer found in adjacent Test Boring B-3. Construction of the residence at this location will be feasible provided the displaced loose soil is removed to expose the lower medium dense soils and replaced with structural fill to finish grade elevations. Specific recommendations as described below will be required to remove the displaced soil and minimize the potential for further movements during and after construction.

The slope stability analyses indicate construction as currently planned will not decrease the stability of site slopes provided our geotechnical recommendations are followed during project design and construction. As discussed above, the northwestern residence's footing and southwestern detention vault's floor will need to be constructed at elevations, such that surcharge loads from these structures will not destabilize slopes. Other features such as retaining walls and/or changes in final site grades will also affect stability of the site slope. Additional analyses will be required to further evaluate stability of site slopes and adjacent properties.

Most of the site soils contain a sufficient percentage by weight of fines (silt- and clay-sized particles) such that they will be difficult to compact as structural fill when too wet or too dry. The contractor should be prepared to dry soils to facilitate compaction during earthwork activities. If earthwork activities take place during the winter season, the contractor should be prepared to import free-draining granular material for use as structural fill and backfill.

Detailed recommendations regarding these issues and other geotechnical design considerations are provided in the following sections of this report. These recommendations should be incorporated into the final design drawings and construction specifications.

4.2 Site Preparation and Grading

To prepare the site for construction, we recommend stripping and removing all vegetation and organic surface soils from construction areas. Test Borings B-2 and B-3 indicate stripping depths of four to six inches will be required to remove topsoil at the site. Organic soils will not be suitable for use as structural fill but may be used for limited depths in nonstructural areas or for landscaping purposes. Demolition of the existing structure should include removal of existing foundations and slabs, as well as abandonment of underground utilities. Abandoned utility pipes that fall outside of new building areas can be left in place provided they are sealed to prevent intrusion of groundwater seepage and soil.

As discussed above, overexcavation to remove loose displaced soils at the northeastern soil slump location will be required to minimize the potential for further soil movements and provide adequate support for the new residence. We recommend removing all loose soils associated with the slump to expose the underlying medium dense silty sand or sand with silt previously unaffected by the soil movements. We recommend removing the displaced soils by starting at the top adjacent to the scarp such that weight (driving force) imposed on displaced downslope soils is reduced as top-down excavation and removal proceeds. Under no circumstances shall undermining of toe support occur below the slump area during its removal or during overall slope grading activities. Upon removal of the loose soils, we recommend grading a key trench at the toe of the excavated area and establishing benched subgrades prior to placing structural fill. A slope key and bench detail is attached as Figure 4.

In general, where loose soils are present during building construction, we recommend removing them to expose the medium dense silty sand or sand and restoring footing subgrades with structural fill. Prior to placing fill, all exposed bearing surfaces should be observed by a representative of Terra Associates, Inc. to verify soil conditions are as expected and suitable for support of new fill. If excessively yielding areas are observed and they cannot be stabilized in place by compaction, we recommend that the affected soils be excavated and removed to firm bearing and grade restored with new structural fill.

The silty sand soils at the site contain a sufficient percentage of fines (silt- and clay-sized particles) such that they will be difficult to compact as structural fill if they are too wet or too dry. Accordingly, the ability to use these soils from site excavations as structural fill will depend on their moisture contents and the prevailing weather conditions during construction. Soils that are too wet to properly compact could be dried by aeration during dry weather conditions or treated with cement or lime additives to facilitate compaction. If an additive is used, additional Best Management Practices (BMPs) for its use will need to be incorporated into the Temporary Erosion and Sedimentation Control plan (TESC) for the project.

If grading activities are planned during the wet winter months, or if they are initiated during the summer and extend into fall and winter, the owner should be prepared to import wet-weather structural fill. For this purpose, we recommend importing a granular soil that meets the following grading requirements:

U.S. Sieve Size	Percent Passing
6 inches	100
No. 4	75 maximum
No. 200	5 maximum*

*Based on the 3/4-inch fraction.

Prior to use, Terra Associates, Inc. should examine and test all materials imported to the site for use as structural fill.

Structural fill should be placed in uniform loose layers not exceeding 12 inches and compacted to a minimum of 95 percent of the soil's maximum dry density, as determined by American Society for Testing and Materials (ASTM) Test Designation D-1557 (Modified Proctor). The moisture content of the soil at the time of compaction should be within two percent of its optimum as determined by this ASTM standard. In nonstructural areas, the degree of compaction can be reduced to 90 percent. Structural fill placed in City rights of way should conform to City of Kirkland specifications and compaction requirements.

Slopes and Embankments

All permanent cut and fill slopes should be graded with a finished inclination of no greater than 2:1. Upon completion of grading, the slope face should be appropriately vegetated or provided with other physical means to guard against erosion. Final grades at the top of the slope must promote surface drainage away from the slope crest. Water must not be allowed to flow uncontrolled over the slope face. If surface runoff must be directed towards the slope, the runoff should be controlled at the top of the slope, piped in a closed conduit installed on the slope face, and taken to an appropriate point of discharge beyond the toe.

All fill placed for embankment construction should meet the structural fill requirements outlined in this section. In addition, at the northeastern soil slump location, and any site location where new fills will be placed over existing slopes of 20 percent or greater, the structural fill should be keyed and benched into competent native slope soils. Figure 4 presents a typical slope key and bench configuration.

At minimum, a toe drain should be installed in the key cut as shown on Figure 4. If seepage conditions are observed, drains may also be required along individual benches excavated on the slope face. The need for drains along the upper benches will be best determined in the field at the time of construction.

Retaining Wall Options

In addition to conventional cantilever concrete walls, several retaining wall options are available to accommodate vertical grade breaks at the site. These include tiered rockeries, or a single rockery built no higher than 8 feet and constructed against very dense till soil cuts, or gravity block retaining wall systems. For support of new fills, several proprietary segmental block or panel mechanically stabilized earth (MSE) wall systems can be considered. We are available to provide specific wall designs for the chosen option, if requested.

4.3 Excavations

All excavations at the site associated with confined spaces, such as those made for utility construction, must be completed in accordance with local, state, and federal requirements. Based on the Washington Industrial Safety and Health Act (WISHA) regulations, the upper loose to medium dense soils would be classified as Type C soils. The dense soils would be classified as Type B soils. Accordingly, for temporary excavations of more than 4 feet and less than 20 feet in depth, the side slopes in Type C soils should be laid back at a slope inclination of 1.5:1 (Horizontal:Vertical) or flatter. Side slopes in Type B soils can be laid back at a slope inclination of 1:1 or flatter

The above information is provided solely for the benefit of the owner and other design consultants and should not be construed to imply that Terra Associates, Inc. assumes responsibility for job site safety. It is understood that job site safety is the sole responsibility of the project contractor.

4.4 Foundations

The proposed structure may be supported on conventional spread footing foundations bearing on competent native soils or on structural fill placed above the native soils as recommended in Section 4.2 of this report. Perimeter foundations exposed to the weather should bear at a minimum depth of 1.5 feet below final exterior grades for frost protection. Interior foundations can be constructed at any convenient depth below the floor slab.

We recommend foundations supported on undisturbed native soils, or structural fill be designed for a net allowable bearing capacity of 2,500 pounds per square foot (psf). For short-term loads, such as wind and seismic, a one-third increase in these allowable capacities can be used in design. With the anticipated loads and this bearing stress applied, foundation settlements should be less than one-half inch total and one-quarter inch differential.

For designing foundations to resist lateral loads, a base friction coefficient of 0.35 can be used. Passive earth pressure acting on the sides of the footings may also be considered. We recommend calculating this lateral resistance using an equivalent fluid weight of 350 pounds per cubic foot (pcf). We recommend not including the upper 12 inches of soil in this computation because they can be affected by weather or disturbed by future grading activity. This value assumes the foundations will be constructed neat against competent native soil or the excavations are backfilled with structural fill, as described in Section 4.2 of this report. The recommended passive and friction values include a safety factor of 1.5.

4.5 Slab-on-Grade Floors

Slab-on-grade floors may be supported on subgrades prepared as recommended in Section 4.2 of this report. Immediately below the floor slab, we recommend placing a four-inch-thick capillary break layer composed of clean, coarse sand or fine gravel that has less than five percent passing the No. 200 sieve. This material will reduce the potential for upward capillary movement of water through the underlying soil and subsequent wetting of the floor slab.

The capillary break layer will not prevent moisture intrusion through the slab caused by water vapor transmission. Where moisture by vapor transmission is undesirable, such as covered floor areas, a common practice is to place a durable plastic membrane on the capillary break layer, then cover the membrane with a layer of clean sand or fine gravel to protect it from damage during construction, and aid in uniform curing of the concrete slab. It should be noted, if the sand or gravel layer overlying the membrane is saturated prior to pouring the slab, it will be ineffective in assisting uniform curing of the slab and can actually serve as a water supply for moisture transmission through the slab that can subsequently affect floor coverings. Therefore, in our opinion, covering the membrane with a layer of sand or gravel should be avoided if floor slab construction occurs during the wet winter months and the layer cannot be effectively drained.

4.6 Retaining Walls

The magnitude of earth pressure development on engineered retaining walls will partly depend on the quality of the wall backfill. We recommend placing and compacting wall backfill as structural fill as described in Section 4.2 of this report. For the drained condition, we recommend designing restrained lower-level walls using an at rest earth pressure equivalent to a fluid weighing 50 pounds per cubic foot (pcf). Walls that are free to deflect and that support level grades should be designed for an active earth pressure equivalent to a fluid weighing 35 pounds per cubic foot (pcf). For evaluation of wall performance under seismic loading, a uniform pressure equivalent to 8H psf, where H is the height of the below-grade portion of the wall should be applied in addition to the static lateral earth pressure. These values are based on a horizontal backslope condition. For walls with a 2:1 backslope the at rest earth pressure should be increased to 65 pcf and the active earth pressure should be increased to 50 pcf. To guard against hydrostatic pressure development, wall drainage must be installed. A typical recommended wall drainage detail is shown on Figure 5.

Friction at the base of wall foundations and passive earth pressures will provide resistance to lateral loads. Values for these parameters are provided in Section 4.4 of this report.

4.7 Infiltration Feasibility

Infiltration as a means for stormwater flow control will not be feasible at the site due to the potential for soil movements on site slopes resulting from saturation by an infiltration system. Stormwater runoff should be controlled using conventional methods.

4.8 Stormwater Detention Vault

For a detention vault design, foundations supported on the medium dense silty sand may be designed for an allowable bearing capacity of 4,000 pounds per square foot (psf). For short-term loads, such as seismic, a one-third increase in this allowable capacity can be used. Friction at the base of the vault foundations and passive earth pressures will provide resistance to the lateral loads. These values are provided in Section 4.4.

The magnitude of earth pressures developing on the vault walls will depend in part on the quality and compaction of the wall backfill. To prevent potential development of hydrostatic pressure and uplift on the vault, wall drainage must be installed. Vault wall drainage should consist of a minimum 4-inch diameter perforated PVC pipe placed around the perimeter of the vault at an elevation no higher than its dead storage elevation. The drainpipe should be enveloped in drainage aggregate that extends as a 12-inch-thick layer to the top of the vault. Alternatively, prefabricated drainage panels, such as Miradrain G100N can be substituted for the 12-inch gravel drainage layer. The panels should extend at least six inches into the drainage aggregate surrounding the perforated drainpipe.

With the recommended wall backfill and drainage, we recommend designing the vault walls for an earth pressure imposed by an equivalent fluid weighing 50 pcf. For any portion of the wall below wall drainpipe elevation, an earth pressure equivalent to a fluid weighing 85 pcf should be used. For evaluating walls under seismic loading, an additional uniform earth pressure equivalent to 8H psf, where H is the height of the below-grade wall in feet, can be used. These values assume a horizontal backfill condition. Where applicable, a uniform horizontal traffic surcharge value of 75 psf should be included in design of vault walls.

The structure will be subject to uplift pressures if drainage is not provided the full depth of the vault structure. The weight of the structure and the weight of the backfill soil above its foundation will provide resistance to uplift. A soil unit weight of 125 pcf can be used for the vault backfill, provided the backfill is placed and compacted as structural fill as recommended above.

4.9 Subsurface Drainage

Surface

Final exterior grades should promote free and positive drainage away from the building areas. We recommend providing a positive drainage gradient away from the building perimeter. If a positive gradient cannot be provided, provisions for collection and disposal of surface water adjacent to the structure should be provided. To minimize adverse impacts to site slopes, stormwater runoff must be directed away from site slopes to approved discharge facilities.

Subsurface

We recommend installing a continuous drain along the outside lower edge of the perimeter building foundations. The drains should be laid to grade at an invert elevation equivalent to the bottom of footing grade. We recommend the drains consist of four-inch diameter perforated PVC pipe that is enveloped in washed ½- to ¾-inch gravel-sized drainage aggregate. The aggregate should extend six inches above and to the sides of the pipe. The foundation drains and roof downspouts should be tightlined separately to an approved point of controlled discharge. All drains should be provided with cleanouts at easily accessible locations. These cleanouts should be serviced at least once each year.

4.10 Utilities

Utility pipes should be bedded and backfilled in accordance with American Public Works Association (APWA) or the City of Kirkland requirements. At minimum, trench backfill should be placed and compacted as structural fill as described in Section 4.2 of this report. Soils excavated onsite should generally be suitable for use as backfill material. If utility construction takes place during the winter, it may be necessary to import suitable wet-weather fill for utility trench backfilling.

5.0 ADDITIONAL SERVICES

Terra Associates, Inc. should review the final designs and specifications in order to verify earthwork and foundation recommendations have been properly interpreted and implemented in project design. We should also provide geotechnical services during construction in order to observe compliance with our design concepts, specifications, and recommendations. This will allow for design changes if subsurface conditions differ from those anticipated prior to the start of construction.

6.0 LIMITATIONS

We prepared this report in accordance with generally accepted geotechnical engineering practices. This report is the copyrighted property of Terra Associates, Inc. and is intended for specific application to the Allen Short Plat project in Kirkland, Washington. This report is for the exclusive use of Allen IKS Properties, LLC, and their authorized representatives. No other warranty, expressed or implied, is made.

The analyses and recommendations presented in this report are based on data obtained from our onsite test pits. Variations in soil conditions can occur, the nature and extent of which may not become evident until construction. If variations appear evident, Terra Associates, Inc. should be requested to reevaluate the recommendations in this report prior to proceeding with construction.

REFERENCE: https://www.bing.com/maps

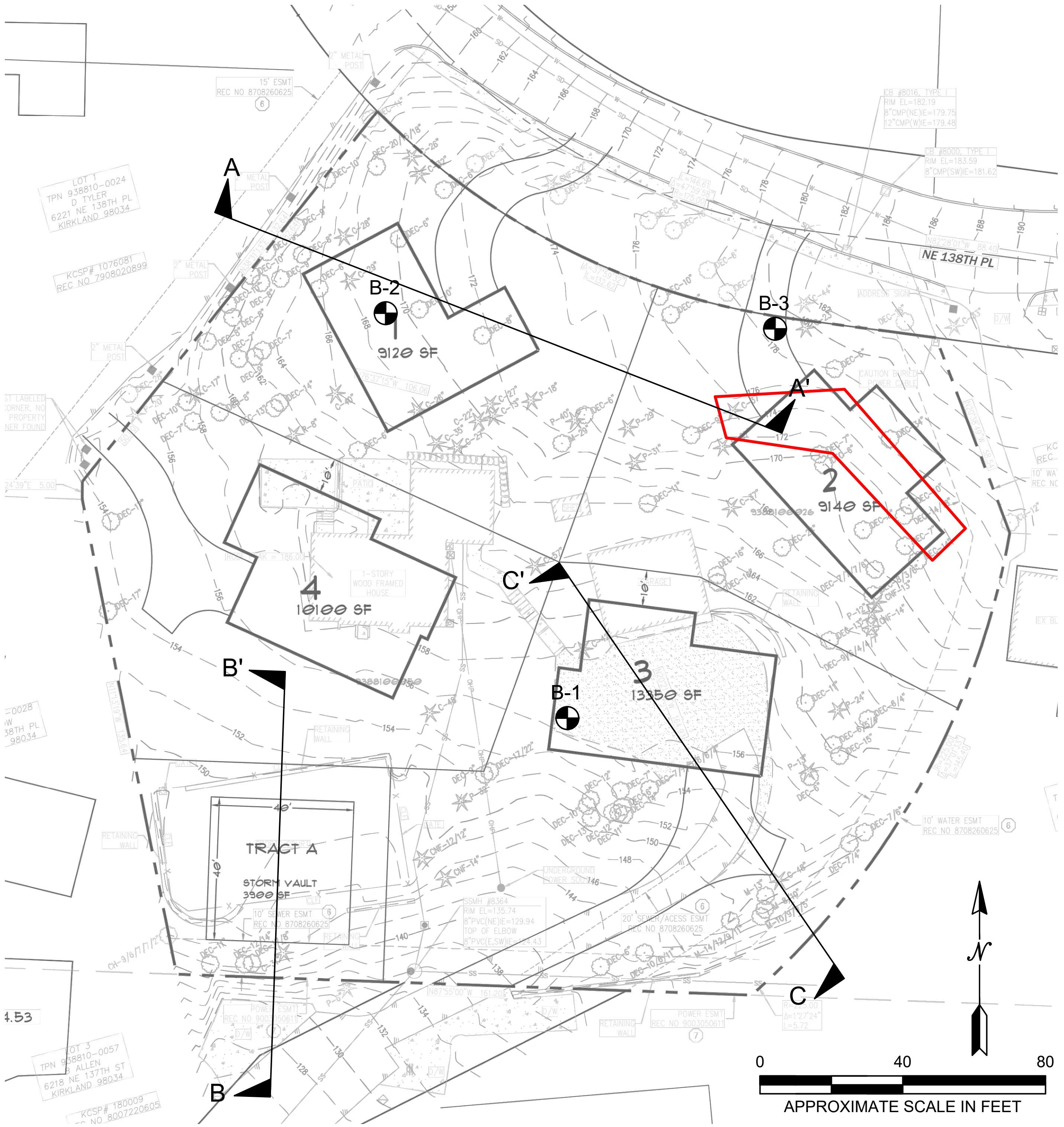
ACCESSED 8/26/2021

Terra Associates, Inc.

Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

VICINITY MAP
ALLEN SHORT PLAT
KIRKLAND, WASHINGTON

Proj.No. T-8603	Date: SEP 2021	Figure 1



NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

REFERENCE: SITE PLAN PROVIDED BY CORE DESIGN.

LEGEND:

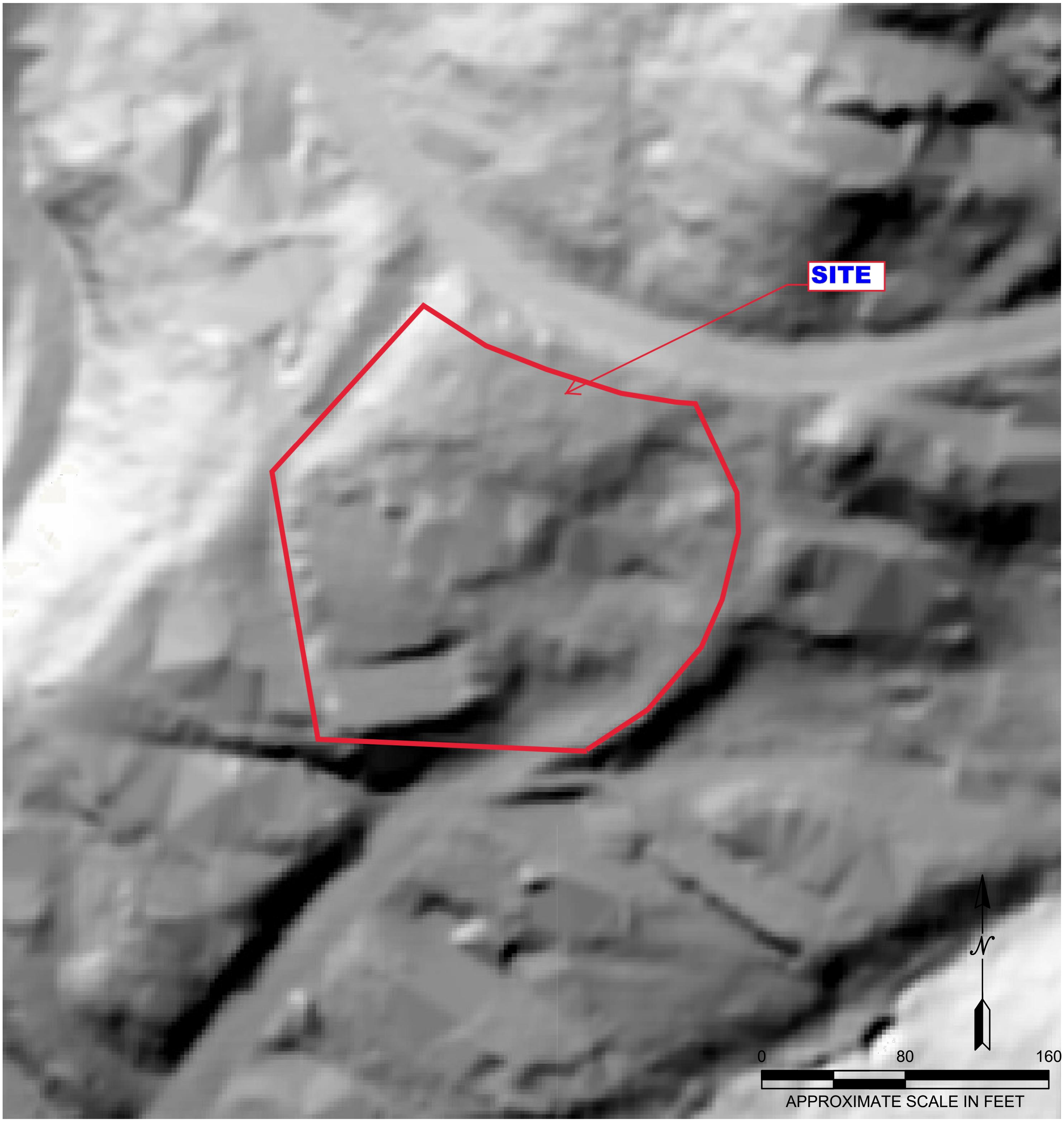
⊕	APPROXIMATE BORING LOCATION
◣___◢	CROSS SECTION LOCATION
🟥	SOIL SLUMP LOCATION

Terra Associates, Inc.

Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

EXPLORATION LOCATION PLAN
ALLEN SHORT PLAT
KIRKLAND, WASHINGTON

Proj.No. T-8603	Date: SEP 2021	Figure 2



NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

LEGEND:

🟥 APPROXIMATE PROPERTY BOUNDARY

REFERENCE: SITE PLAN PROVIDED BY https://lidarportal.dnr.wa.gov/#47.72446:-122.25744:19.

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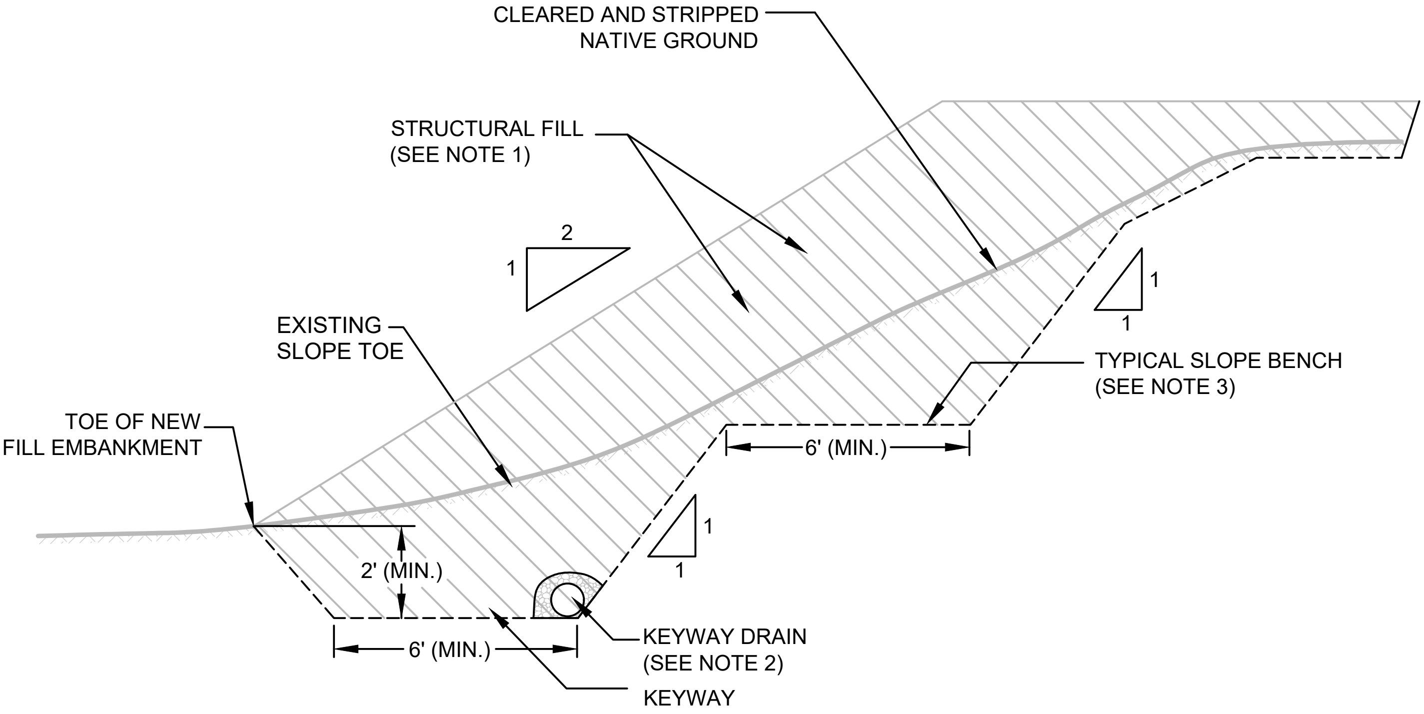
LIDAR MAP
ALLEN SHORT PLAT
KIRKLAND, WASHINGTON

Proj.No. T-8603	Date: SEP 2021	Figure 3



NOT TO SCALE

NOTES:

1) STRUCTURAL FILL SHALL BE COMPACTED TO A MINIMUM OF 95% OF ASTM D 698 MAXIMUM DRY DENSITY VALUE.

2) DRAINS SHALL CONSIST OF 6" DIA. PERFORATED PVC PIPE ENVELOPED IN 1 cu ft OF 3/4" WASHED GRAVEL. DRAIN PIPE SHALL BE DIRECTED TO THE STORM DRAIN SYSTEM OR APPROVED POINT OF DISCHARGE.

3) ADDITIONAL BENCHES AND BENCH DRAINS MAY BE REQUIRED BASED ON FIELD EVALUATION BY THE GEOTECHNICAL ENGINEER.

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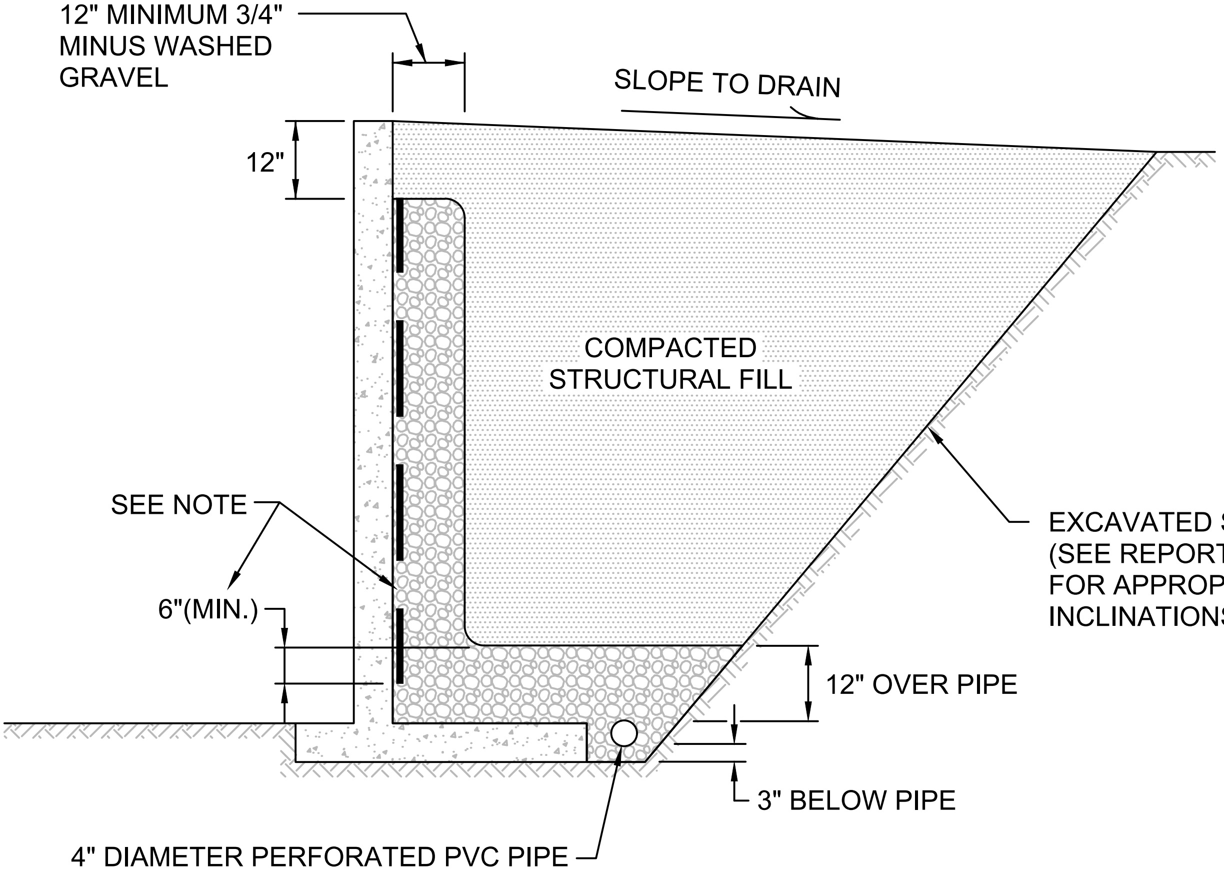
TYPICAL SLOPE KEY AND BENCH DETAIL
ALLEN SHORT PLAT
KIRKLAND, WASHINGTON

Proj.No. T-8603	Date: SEP 2021	Figure 4



NOT TO SCALE

NOTE:

MIRADRAIN G100N PREFABRICATED DRAINAGE PANELS OR SIMILAR PRODUCT CAN BE SUBSTITUTED FOR THE 12-INCH WIDE GRAVEL DRAIN BEHIND WALL. DRAINAGE PANELS SHOULD EXTEND A MINIMUM OF SIX INCHES INTO 12-INCH THICK DRAINAGE GRAVEL LAYER OVER PERFORATED DRAIN PIPE.

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TYPICAL WALL DRAINAGE DETAIL
ALLEN SHORT PLAT
KIRKLAND, WASHINGTON

Proj.No. T-8603	Date: SEP 2021	Figure 5

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

Allen Short Plat
Kirkland, Washington

On August 16, 2021, we investigated subsurface conditions at the site by drilling three test borings to depths of 31.5 and 46.5 feet below existing surface grades. The test borings were drilled with a track-mounted drill rig using hollow-stem auger drilling methods. The approximate test boring locations are shown on Figure 2. The locations were approximately determined by measuring and sighting relative to existing surface features. The Test Boring Logs are presented on Figures A-2 through A-4.

A geotechnical engineer from our office conducted the field exploration, classified the soils encountered, maintained a log of each boring, obtained representative soil samples, and observed pertinent site features. Soil samples were obtained in general accordance with American Society for Testing and Materials (ASTM) Test Designation D-1586. Using this procedure, a two-inch (outside diameter) split barrel sampler was driven 18 inches using a 140-pound hammer free-falling from a height of 30 inches. The number of blows required to drive the sampler 12 inches after an initial 6-inch set is referred to as the Standard Penetration Resistance value or N value. This is an index related to the consistency of cohesive soils and relative density of cohesionless materials. N values obtained for each sampling interval are recorded on the Test Boring Logs. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS) described on Figure A-1.

Representative soil samples obtained from the test borings were placed in sealed containers and taken to our laboratory for further examination and testing. The moisture content of each sample was measured and is reported on the corresponding Test Boring Logs. Grain size analyses were performed on seven samples. The results are shown on Figures A-5 through A-7.

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS More than 50% material larger than No. 200 sieve size	**GRAVELS** More than 50% of coarse fraction is larger than No. 4 sieve	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS More than 50% of coarse fraction is smaller than No. 4 sieve	Clean Sands (less than 5% fines)	SW	Well-graded sands, sands with gravel, little or no fines.
			SP	Poorly-graded sands, sands with gravel, little or no fines.
		Sands with fines	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS More than 50% material smaller than No. 200 sieve size	**SILTS AND CLAYS** Liquid Limit is less than 50%		ML	Inorganic silts, rock flour, clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity. (Lean clay)
			OL	Organic silts and organic clays of low plasticity.
	SILTS AND CLAYS Liquid Limit is greater than 50%		MH	Inorganic silts, elastic.
			CH	Inorganic clays of high plasticity. (Fat clay)
			OH	Organic clays of high plasticity.
HIGHLY ORGANIC SOILS			PT	Peat.

DEFINITION OF TERMS AND SYMBOLS

COHESIONLESS

Density	Standard Penetration Resistance in Blows/Foot
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	>50

COHESIVE

Consistancy	Standard Penetration Resistance in Blows/Foot
Very Soft	0-2
Soft	2-4
Medium Stiff	4-8
Stiff	8-16
Very Stiff	16-32
Hard	>32

⌶	2" OUTSIDE DIAMETER SPILT SPOON SAMPLER
Ⅱ	2.4" INSIDE DIAMETER RING SAMPLER OR SHELBY TUBE SAMPLER
▼	WATER LEVEL (Date)
Tr	TORVANE READINGS, tsf
Pp	PENETROMETER READING, tsf
DD	DRY DENSITY, pounds per cubic foot
LL	LIQUID LIMIT, percent
PI	PLASTIC INDEX
N	STANDARD PENETRATION, blows per foot

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UNIFIED SOIL CLASSIFICATION SYSTEM
ALLEN SHORT PLAT
KIRKLAND, WASHINGTON

Proj.No. T-8603	Date: SEP 2021	Figure A-1

LOG OF BORING NO. B-1

Figure No. A-2

Project: Allen Short Plat **Project No:** T-8603 **Date Drilled:** August 16, 2021

Client: Allen IKS Properties **Driller:** Boretec 1 **Logged By:** KPR

Location: Kirkland, Washington **Depth to Groundwater:** N/A **Approx. Elev:** 156 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot 10 30 50	Moisture Content (%)
0					
	I	Light grayish-brown silty SAND, trace gravel, fine to medium grained, moist. (SM) (Older sand; Qos)	Medium Dense	15	5.2
5	I		Loose	9	5.2
	I		Medium Dense	14	6.8
10	I		Dense	30	6.3
	I		Medium Dense	18	9.4
15	I		Dense	31	12.3
20	I	Grayish-brown SAND with silt, trace gravel, fine to medium grained, moist. (SP-SM)	Medium Dense	17	7.0
25	I		Dense	34	9.6
		Grayish-brown silty SAND, fine grained, moist. (SM)			
30	I			40	9.1
		Test boring terminated at 31.5 feet. No groundwater.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

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LOG OF BORING NO. B-2

Figure No. A-3

Project: Allen Short Plat **Project No:** T-8603 **Date Drilled:** August 16, 2021

Client: Allen IKS Properties **Driller:** Boretec 1 **Logged By:** KPR

Location: Kirkland, Washington **Depth to Groundwater:** N/A **Approx. Elev:** 170 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot 10 30 50	Moisture Content (%)
0		4 inches TOPSOIL			
	I	Light brown mottled silty SAND, fine grained, dry to moist. (SM) (Older sand; Qos)	Medium Dense	25	6.6
5	I			27	6.7
	I	No mottling; moist.	Dense	30	8.3
10	I		Medium Dense	18	8.1
	I	Brownish-gray silty SAND, fine to medium grained, moist to wet. (SM)		19	8.5
15	I			18	19.3
20	I	Grayish-brown SAND with silt, fine to medium grained, moist. (SP-SM)		26	7.4
25	I	Grayish-brown SAND, fine to medium grained, moist. (SP)		19	5.8
30	I			20	5.1
35	I	Brownish gray SAND with silt, fine to medium grained, moist. (SP-SM)		28	6.1
40	I		Dense	44	6.9
		Test boring terminated at 41.5 feet. No groundwater.			

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

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LOG OF BORING NO. B-3

Figure No. A-4

Project: Allen Short Plat **Project No:** T-8603 **Date Drilled:** August 16, 2021

Client: Allen IKS Properties **Driller:** Boretec 1 **Logged By:** KPR

Location: Kirkland, Washington **Depth to Groundwater:** N/A **Approx. Elev:** 178 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	SPT (N) Blows / foot 10 30 50	Moisture Content (%)
0		6 inches TOPSOIL			
	I	Light brown silty SAND, fine to medium grained, dry to moist. (SM) (Older sand; Qos)	Loose	6	5.8
5	I			7	6.0
	I		Medium Dense	18	8.5
10	I	Grayish-brown silty SAND, fine to medium grained, moist. (SM)		19	8.2
	I	Grayish-brown SAND with silt, fine to medium grained, moist. (SP-SM)		25	7.4
15	I			27	8.6
20	I		Dense	37	6.5
25	I	Brownish-gray silty SAND, fine to medium grained, moist. (SM)		39	7.6
30	I	Brownish-gray SAND with silt, fine to medium grained, moist. (SP-SM)		49	7.2
35	I	Brownish-gray SAND, fine to medium grained moist. (SP)	Very Dense	50	6.2
40	I	Brownish-gray SAND with silt, fine to medium grained, moist. (SP-SM)		51	8.5
45	I			66	6.5
		Test boring terminated at 46.5 feet. No groundwater.			
50					

NOTE: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site

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Particle Size Distribution Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	5.4	5.6	20.5	50.8	17.7	
□	0.0	0.0	0.1	0.4	15.1	61.8	22.6	
△	0.0	0.0	3.4	1.7	11.4	42.7	40.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.0655	0.3544	0.2928	0.1740				
□			0.4305	0.2854	0.2421	0.1404				
△			0.4517	0.2102	0.1431					

Material Description	USCS	AASHTO
○ Silty SAND	SM	
□ Silty SAND	SM	
△ Silty SAND	SM	

Project No. T-8603 **Client:** Allen IKS Properties, LLC
Project: Allen Short Plat

○ **Location:** B-1 **Depth:** -5 feet
□ **Location:** B-1 **Depth:** -30 feet
△ **Location:** B-2 **Depth:** -2.5 feet

Terra Associates, Inc.

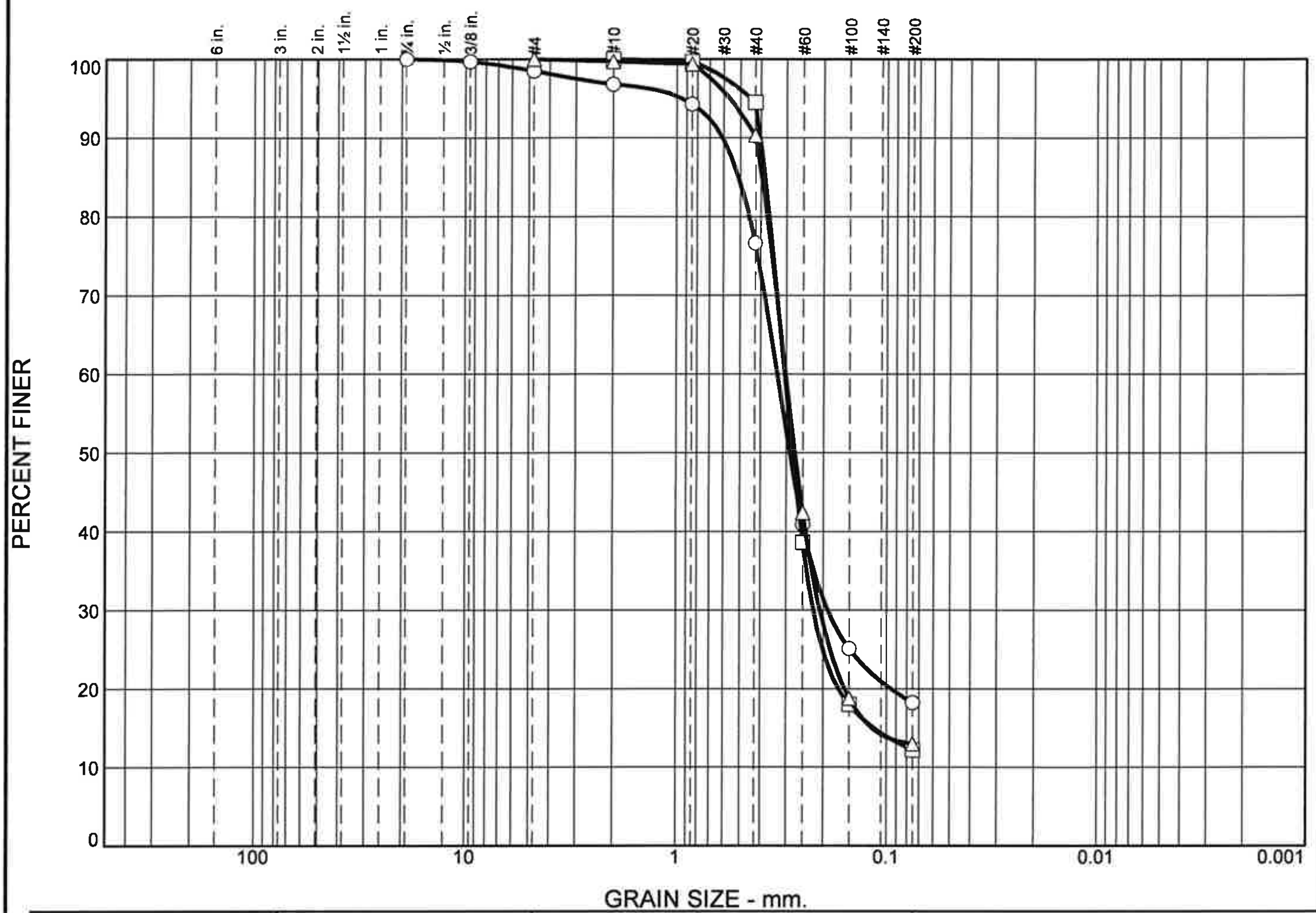
Kirkland, WA

Remarks:

Figure A-5

Tested By: FQ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.5	1.7	20.2	58.4	18.2	
□	0.0	0.0	0.0	0.0	5.5	82.3	12.2	
△	0.0	0.0	0.0	0.3	9.4	77.3	13.0	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.5104	0.3320	0.2888	0.1905				
□			0.3815	0.3060	0.2804	0.2220	0.1146			
△			0.3948	0.3025	0.2728	0.2069	0.1172			

Material Description	USCS	AASHTO
○ Silty SAND	SM	
□ SAND with silt	SP-SM	
△ Silty SAND	SM	

Project No. T-8603 **Client:** Allen IKS Properties, LLC

Project: Allen Short Plat

○ **Location:** B-2 **Depth:** -12.5 feet

□ **Location:** B-2 **Depth:** -35 feet

△ **Location:** B-3 **Depth:** -10 feet

Terra Associates, Inc.

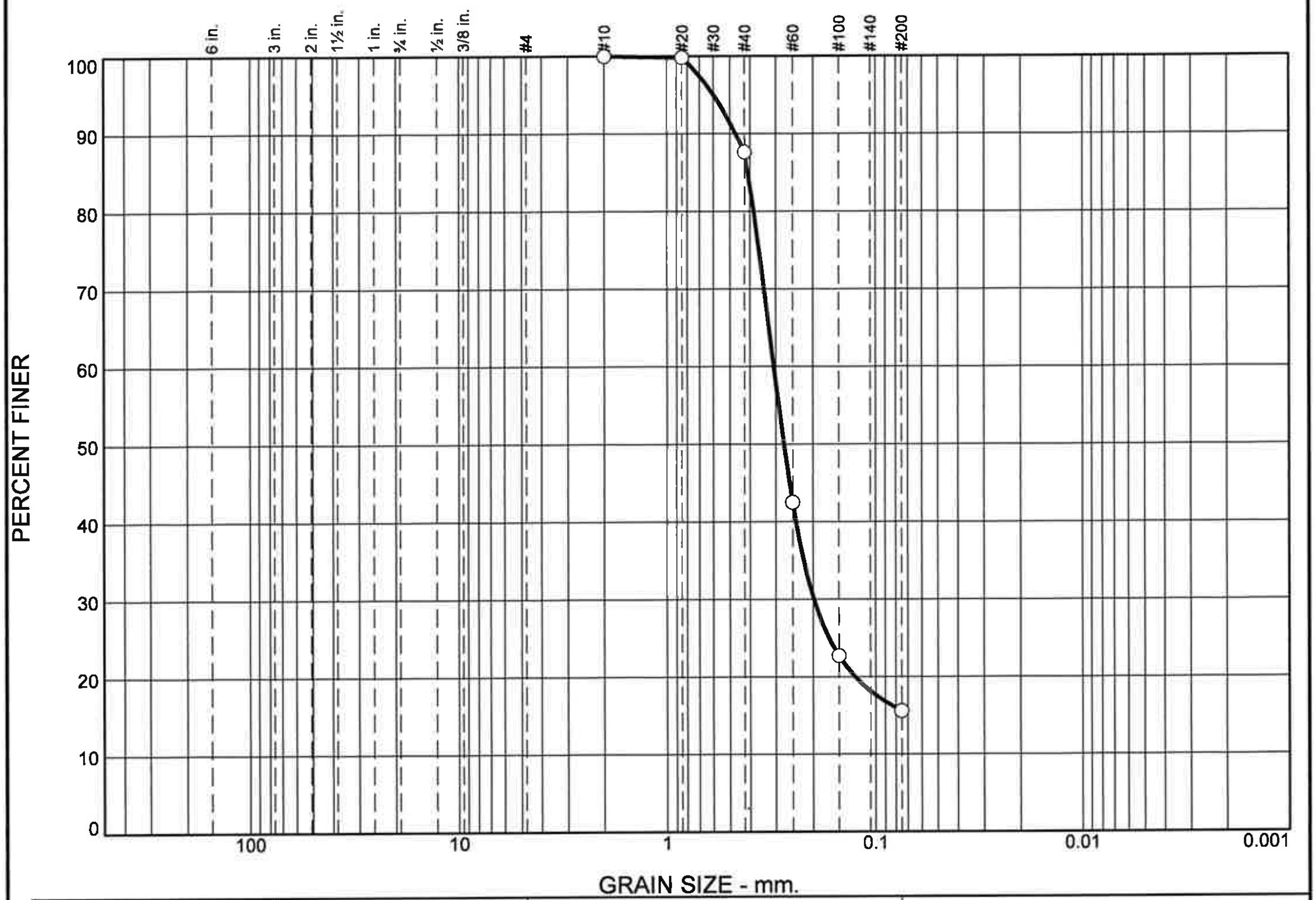
Kirkland, WA

Remarks:

Figure A-6

Tested By: FQ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	12.4	72.0	15.6	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.4090	0.3071	0.2748	0.1981				

Material Description	USCS	AASHTO
○ Silty SAND	SM	

Project No. T-8603 **Client:** Allen IKS Properties, LLC
Project: Allen Short Plat

○ **Location:** B-3 **Depth:** -25 feet

Remarks:

Terra Associates, Inc.

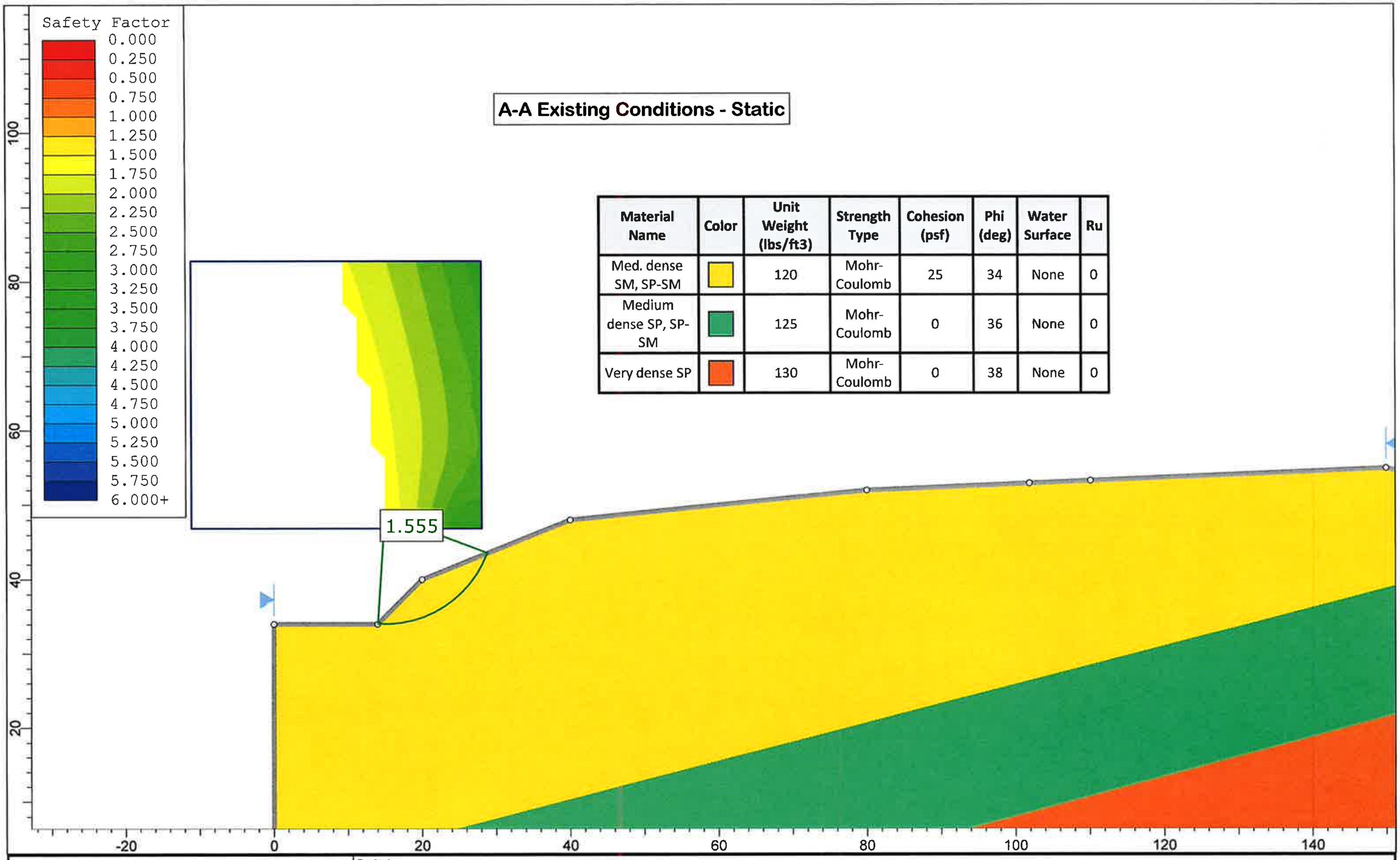
Kirkland, WA

Figure A-7

Tested By: FQ

APPENDIX B
SLIDE GRAPHICAL OUTPUT

A-A Existing Conditions - Static

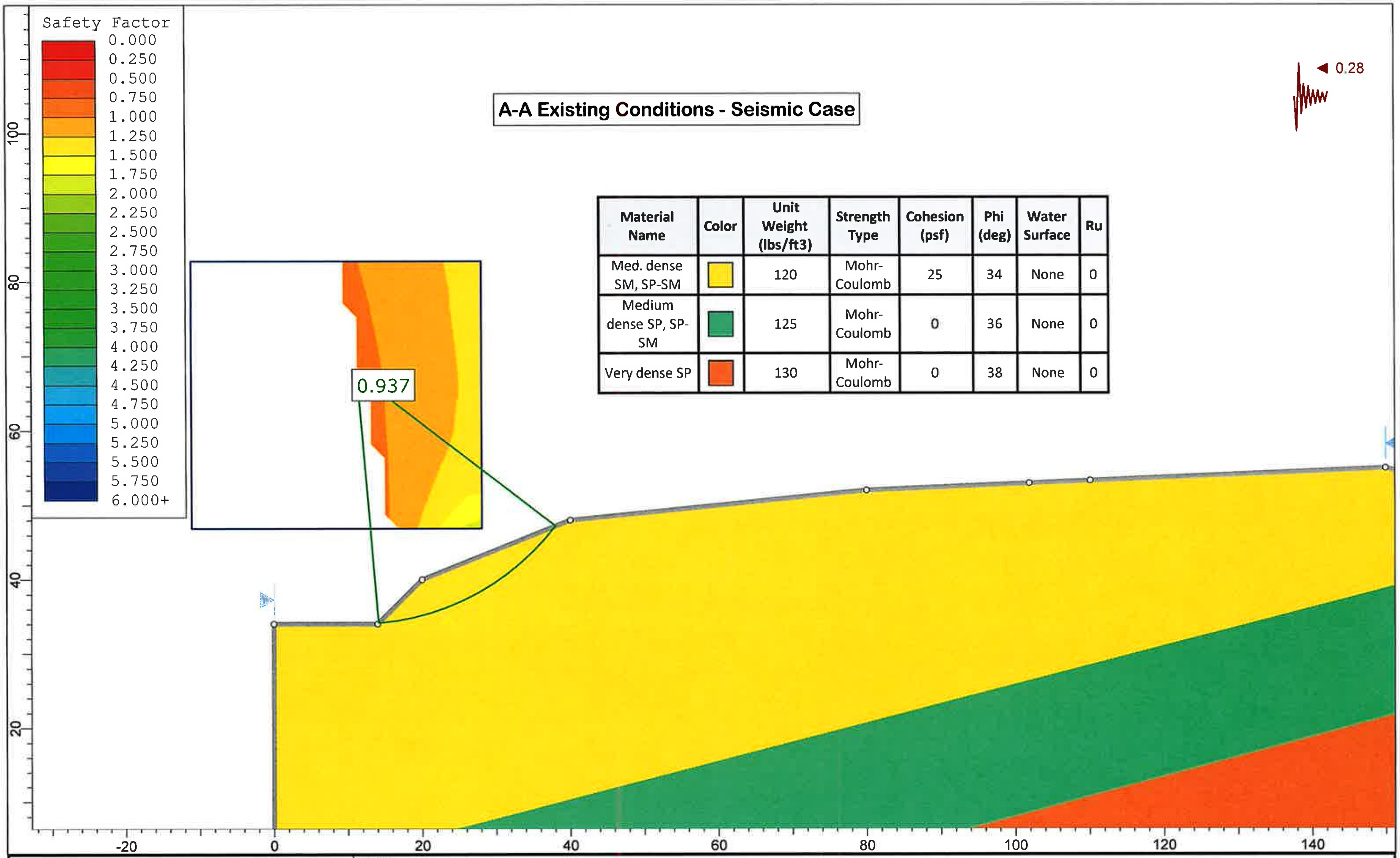


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM, SP-SM	🟨	120	Mohr-Coulomb	25	34	None	0
Medium dense SP, SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0
Very dense SP	🟧	130	Mohr-Coulomb	0	38	None	0

rocscience

SLIDEINTERPRET 9.008

Project	Allen Short Plat		
Group	8603 A-A - Existing.slim	*Scenario*	8603 A-A - Existing.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 A-A - Existing.slim



A-A Existing Conditions - Seismic Case

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM, SP-SM	🟨	120	Mohr-Coulomb	25	34	None	0
Medium dense SP, SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0
Very dense SP	🟧	130	Mohr-Coulomb	0	38	None	0

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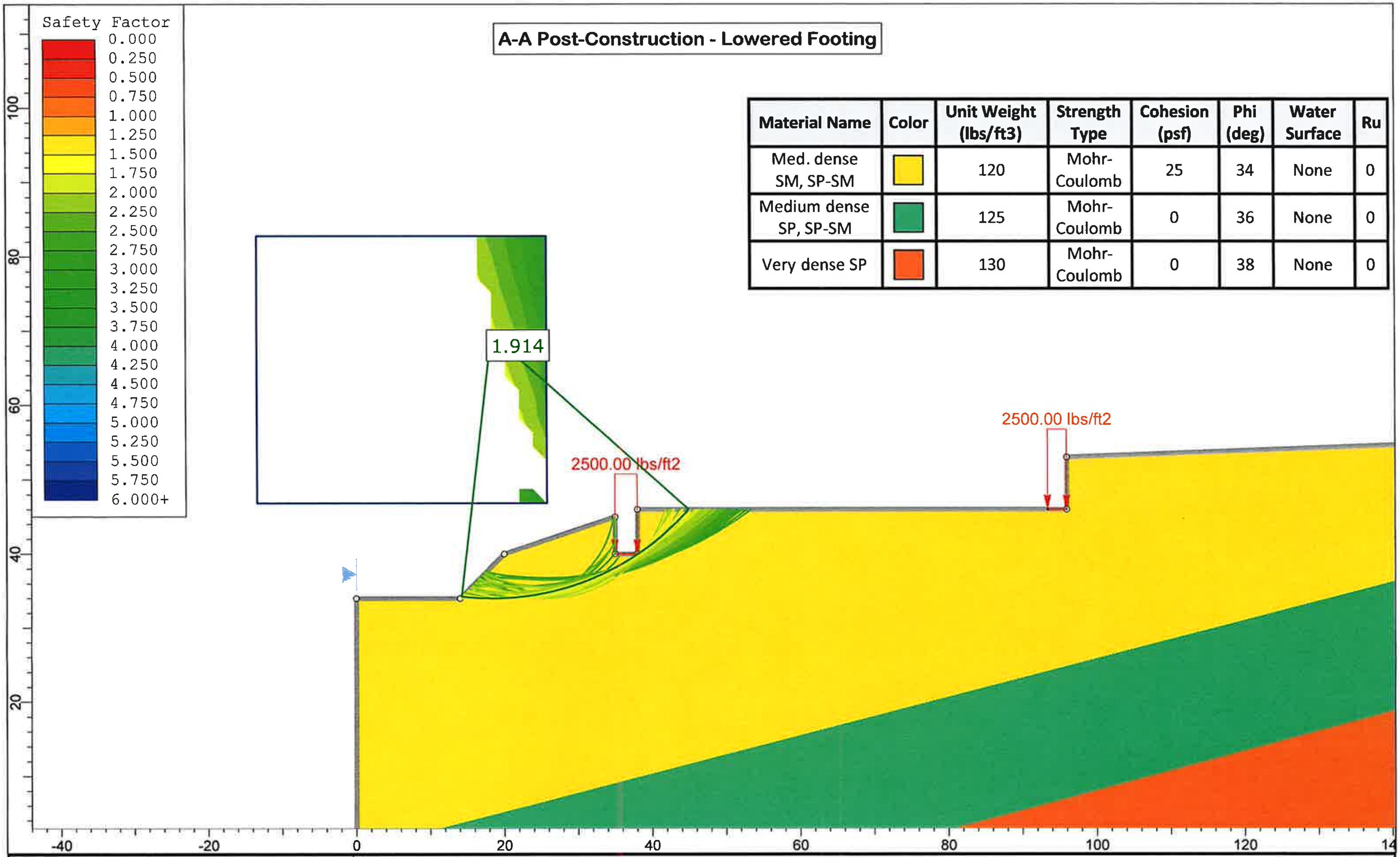
SLIDEINTERPRET 9.008

Project	Allen Short Plat		
Group	8603 A-A - Existing.slim	*Scenario*	8603 A-A - Existing.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 A-A - Existing.slim



A-A Post-Construction - Lowered Footing

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM, SP-SM	🟨	120	Mohr-Coulomb	25	34	None	0
Medium dense SP, SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0
Very dense SP	🟧	130	Mohr-Coulomb	0	38	None	0

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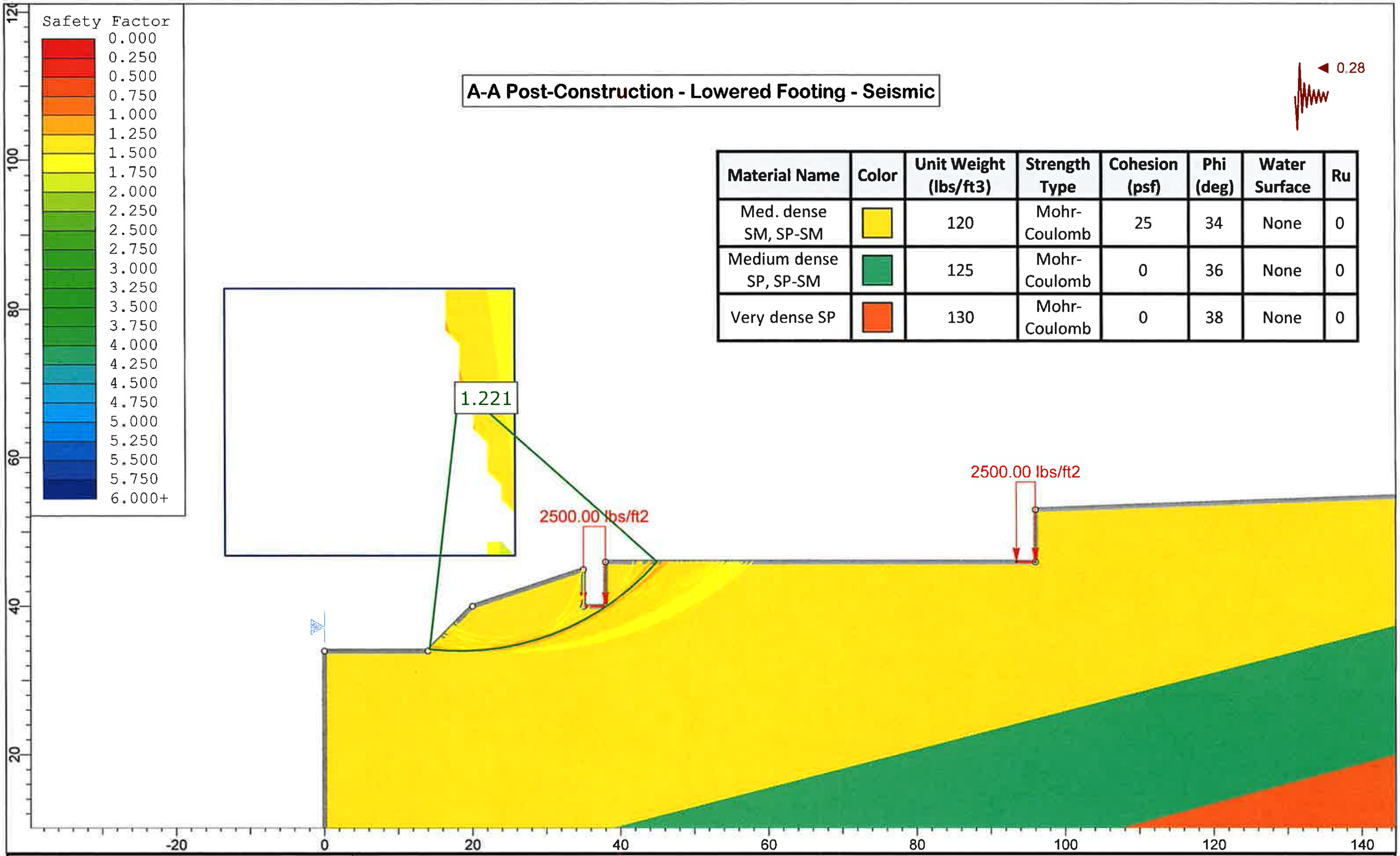
SLIDEINTERPRET 9.008

Project	Allen Short Plat		
Group	8603 A-A - Post Construction.slim	*Scenario*	8603 A-A - Post Construction.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 A-A - Post Construction.slim



A-A Post-Construction - Lowered Footing - Seismic

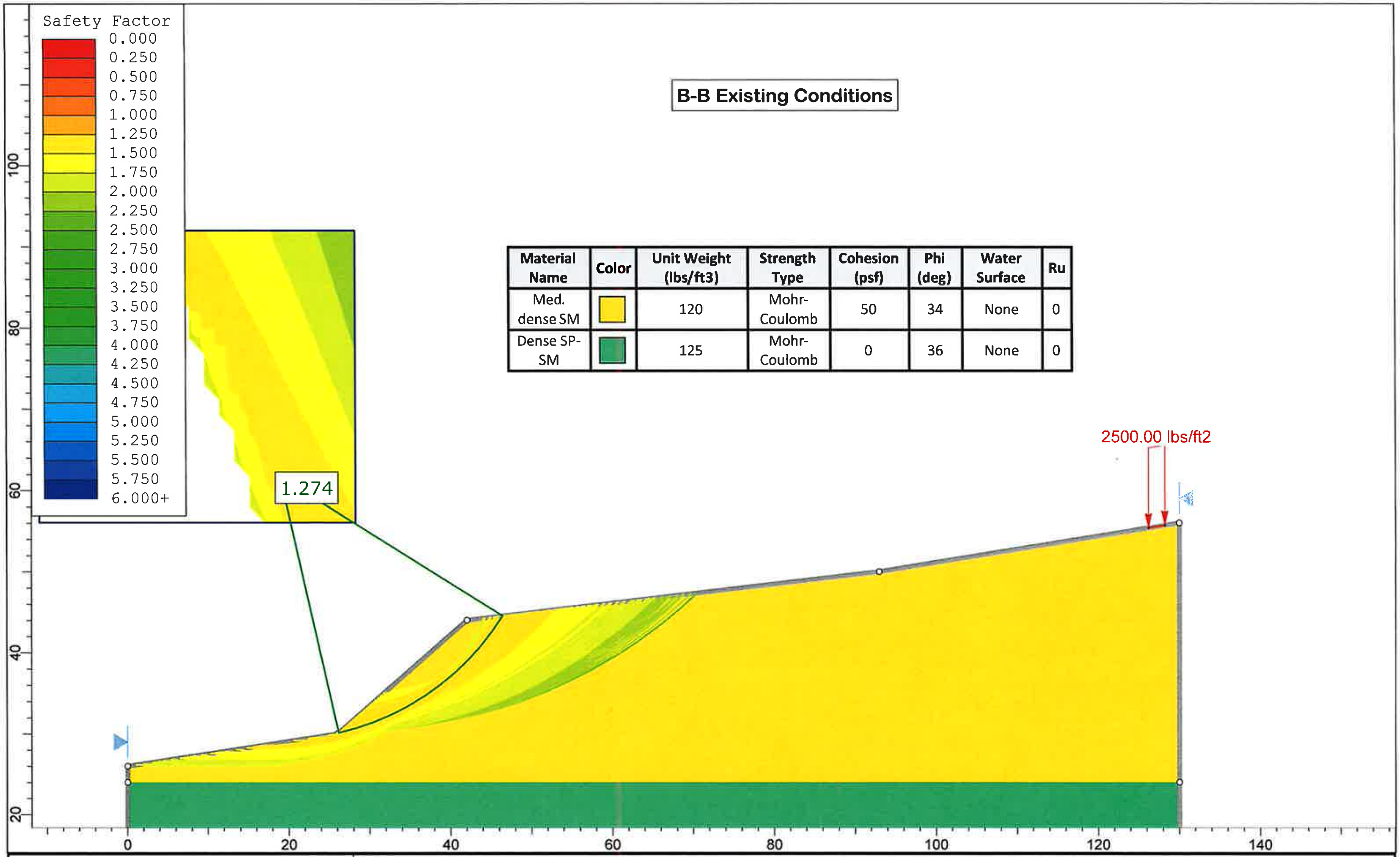
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM, SP-SM	🟨	120	Mohr-Coulomb	25	34	None	0
Medium dense SP, SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0
Very dense SP	🟧	130	Mohr-Coulomb	0	38	None	0

rocscience

SLIDEINTERPRET 9.008

Project	Allen Short Plat		
Group	8603 A-A - Post Construction.slim	*Scenario*	8603 A-A - Post Construction.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 A-A - Post Construction.slim

B-B Existing Conditions



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

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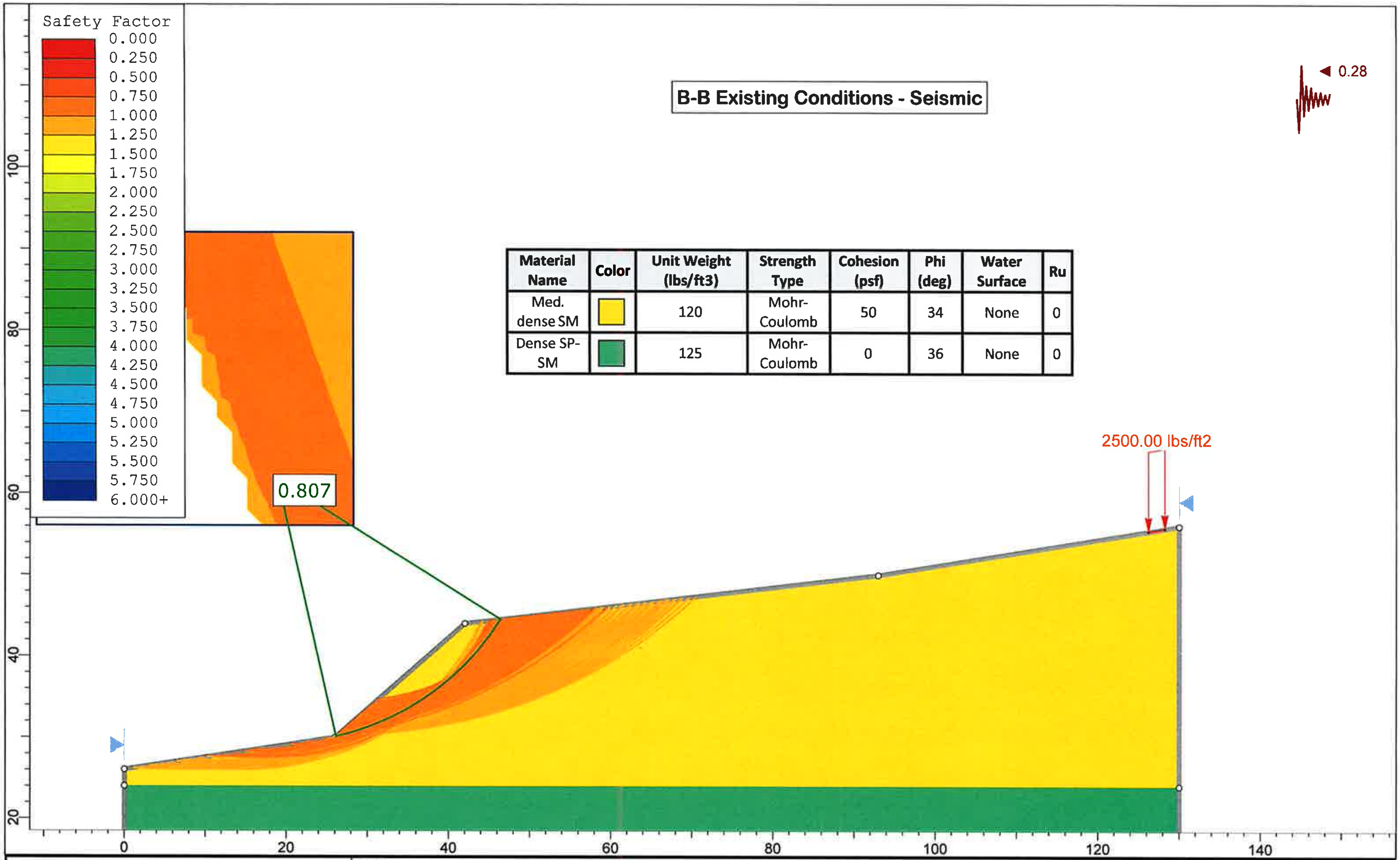
SLIDEINTERPRET 9.008

Project Allen Short Plat

Group	8603 B-B - Existing.slim	*Scenario*	8603 B-B - Existing.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 B-B - Existing.slim



B-B Existing Conditions - Seismic

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

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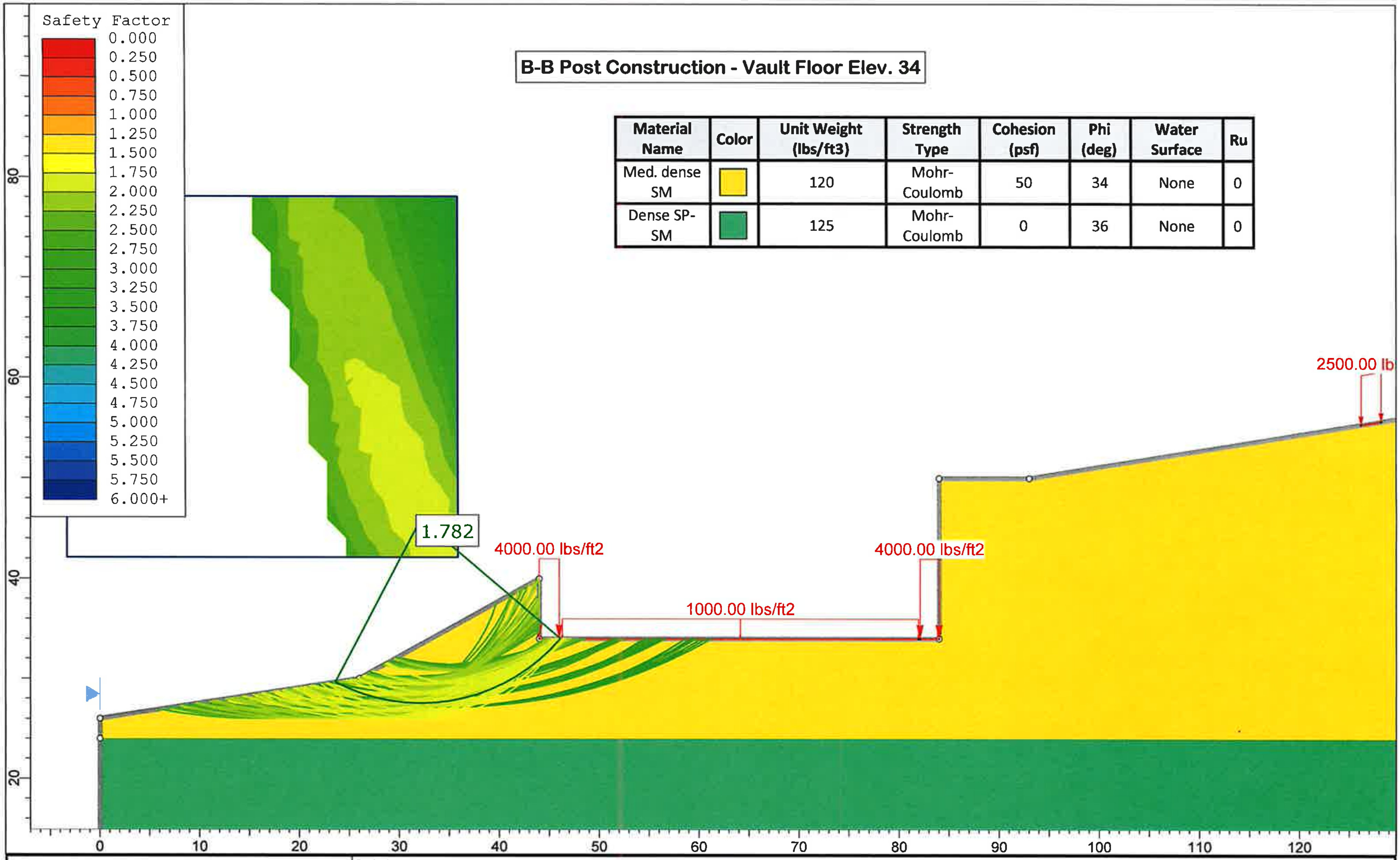
SLIDEINTERPRET 9.008

Project	Allen Short Plat

Group	8603 B-B - Existing.slim	*Scenario*	8603 B-B - Existing.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 B-B - Existing.slim



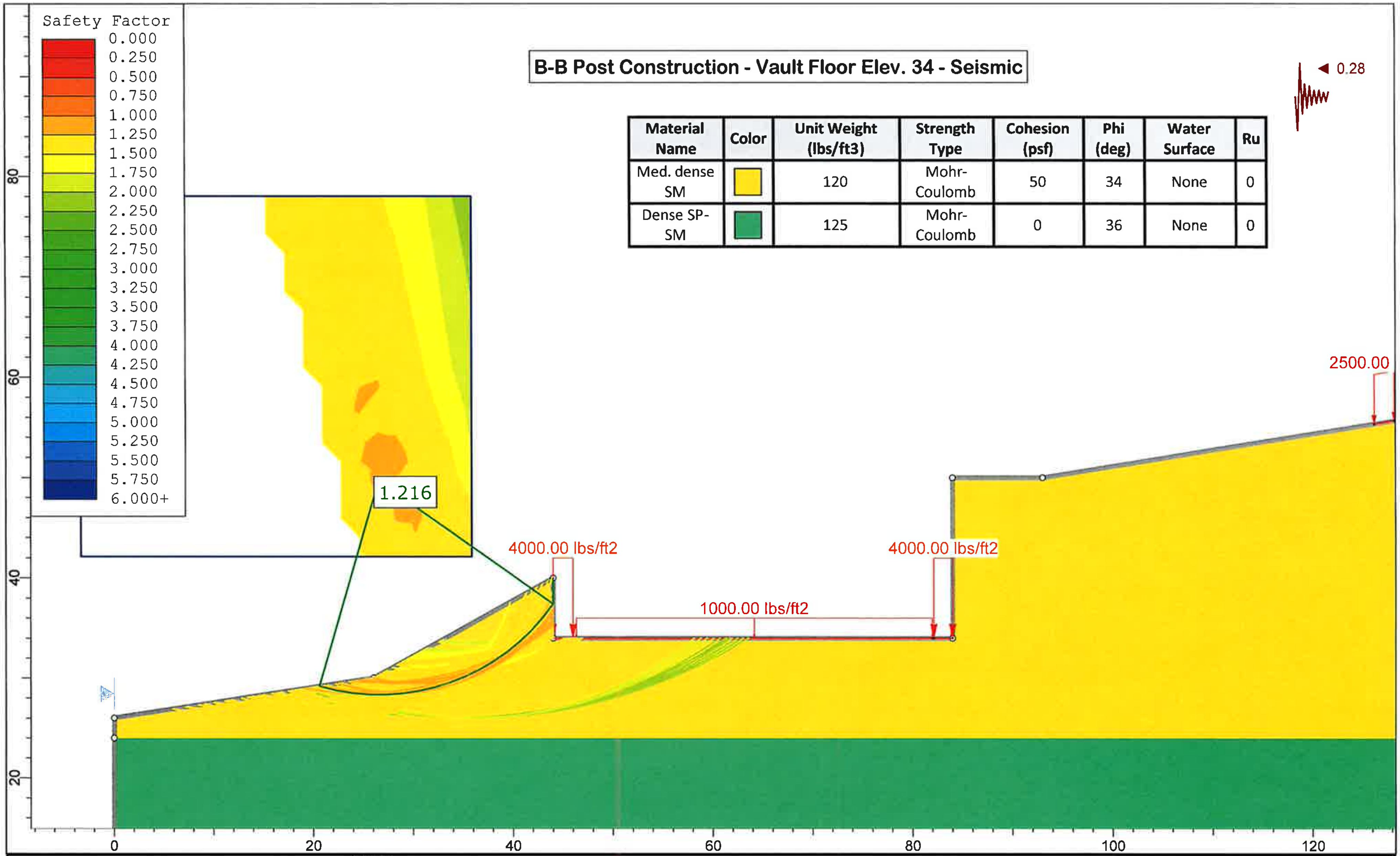
B-B Post Construction - Vault Floor Elev. 34

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

rocscience

SLIDEINTERPRET 9.008

Project	Allen Short Plat		
Group	8603 B-B - Post Construction.slim	*Scenario*	8603 B-B - Post Construction.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 B-B - Post Construction.slim



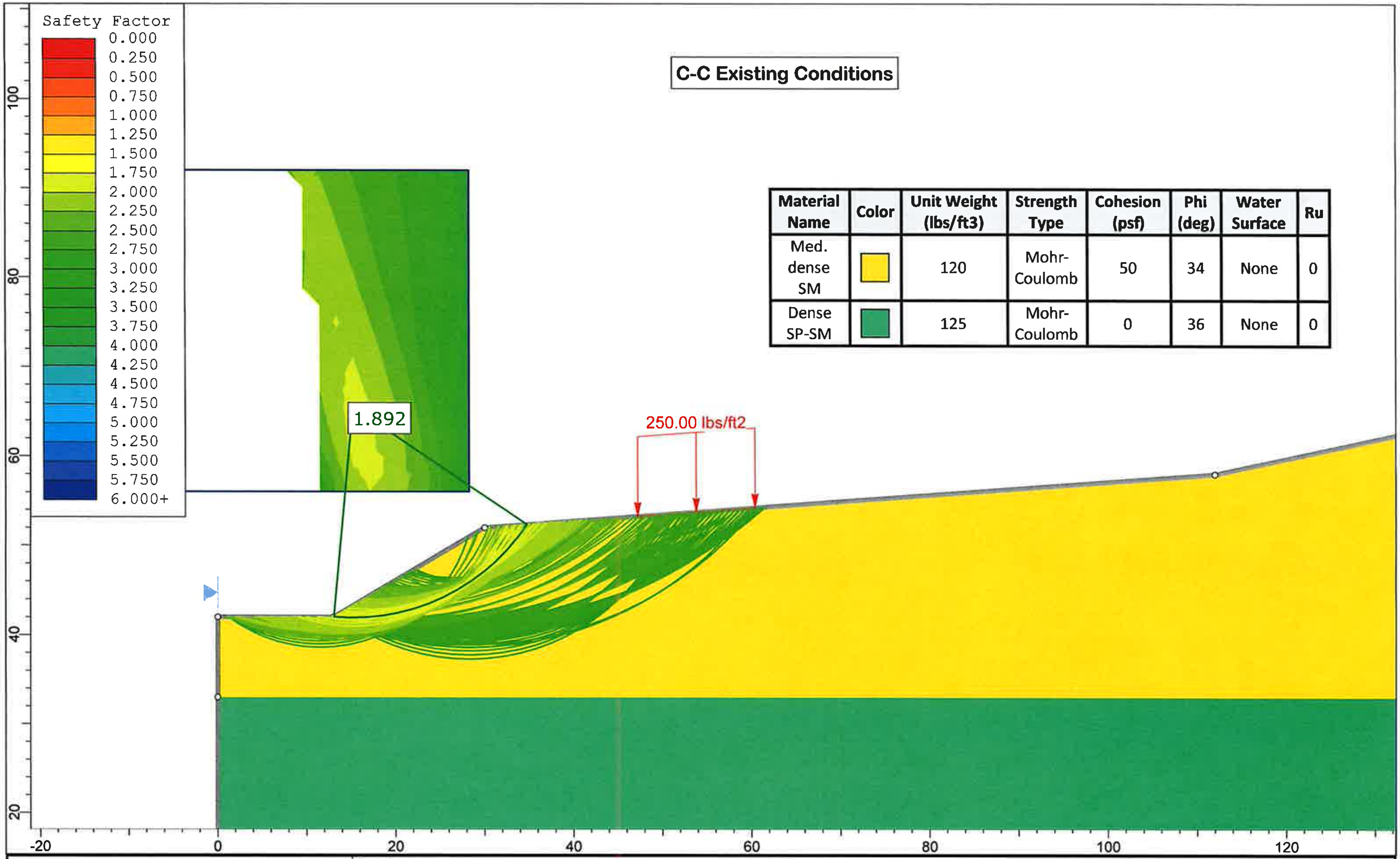
B-B Post Construction - Vault Floor Elev. 34 - Seismic

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

Project	Allen Short Plat		
Group	8603 B-B - Post Construction.slim	*Scenario*	8603 B-B - Post Construction.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 B-B - Post Construction.slim

SLIDEINTERPRET 9.008

C-C Existing Conditions

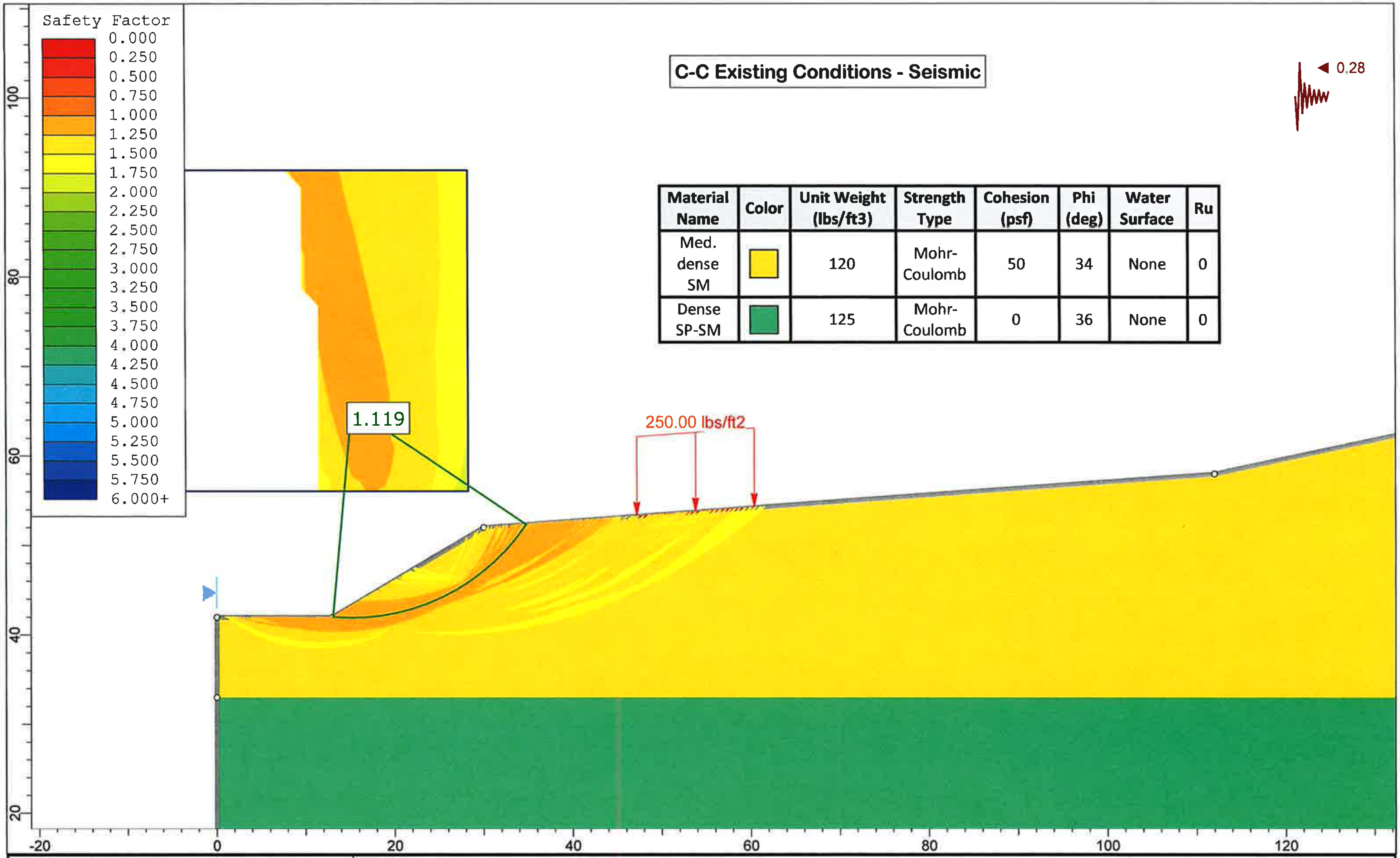


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

rocscience

SLIDEINTERPRET 9.008

Project	Allen Short Plat		
Group	8603 C-C - Existing.slim	*Scenario*	8603 C-C - Existing.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 C-C - Existing.slim



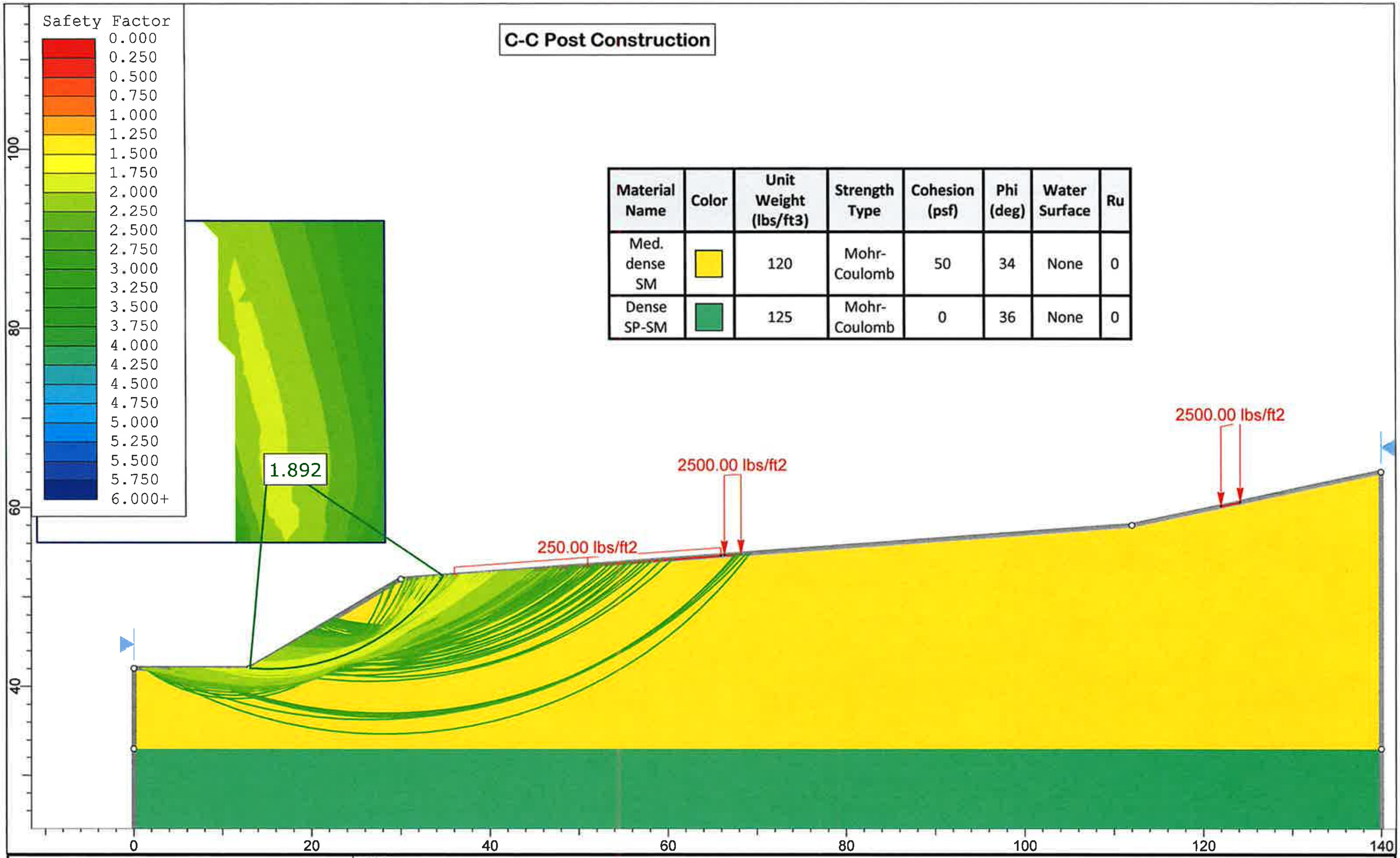
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

rocscience

Project	Allen Short Plat		
Group	8603 C-C - Existing.slim	*Scenario*	8603 C-C - Existing.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 C-C - Existing.slim

SLIDEINTERPRET 9.008

C-C Post Construction

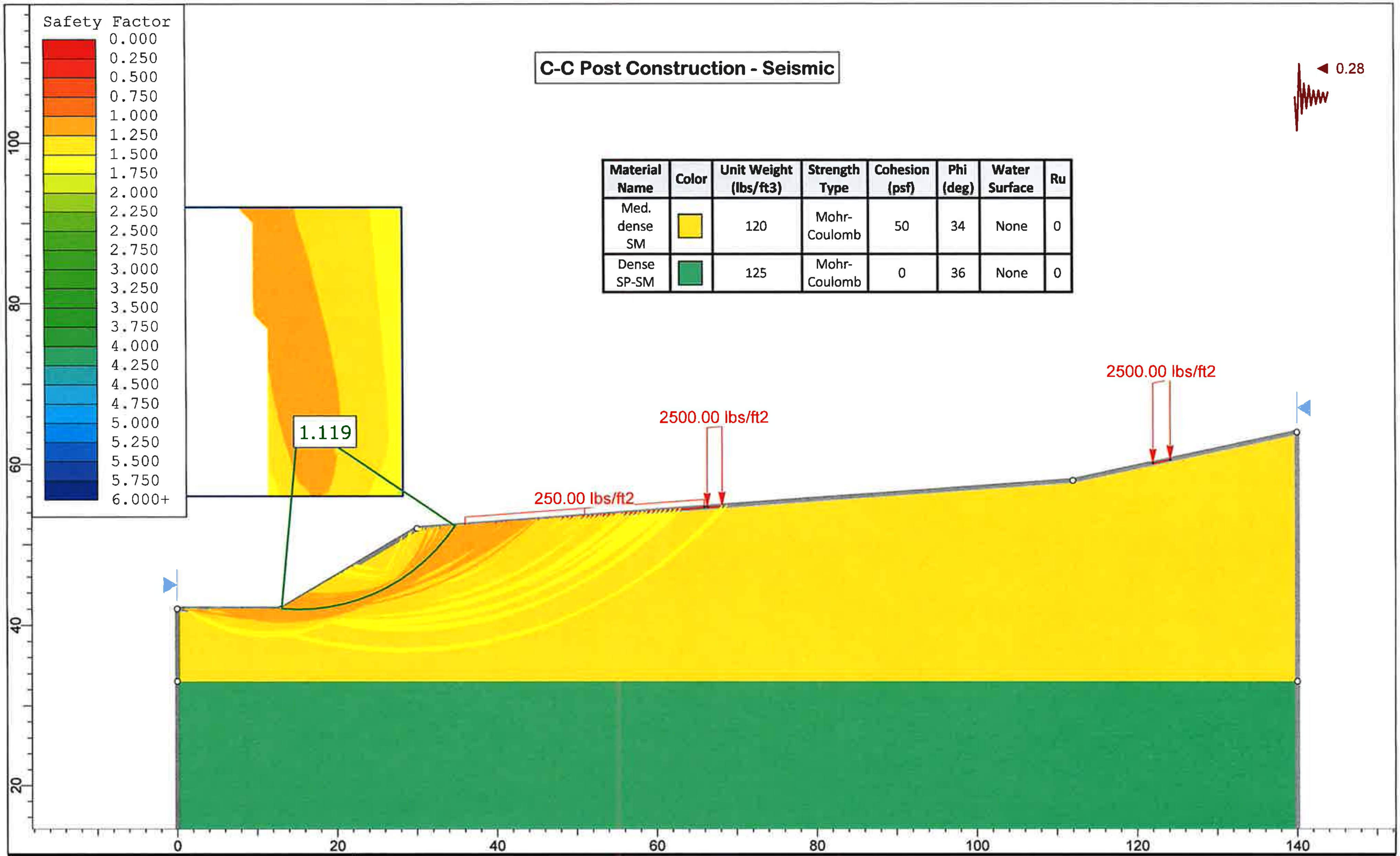


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

rocscience

SLIDEINTERPRET 9.008

Project	Allen Short Plat		
Group	8603 C-C - Post Construction.slim	*Scenario*	8603 C-C - Post Construction.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 C-C - Post Construction.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Med. dense SM	🟨	120	Mohr-Coulomb	50	34	None	0
Dense SP-SM	🟩	125	Mohr-Coulomb	0	36	None	0

rocscience

Project	Allen Short Plat		
Group	8603 C-C - Post Construction.slim	*Scenario*	8603 C-C - Post Construction.slim
Drawn By	KPR	*Company*	Terra Associates, Inc.
Date	8/23/2021	*File Name*	8603 C-C - Post Construction.slim

SLIDEINTERPRET 9.008