Park Heights Short Plat

Preliminary TIR & Downstream Analysis

March 10, 2025

Prepared for

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03/11/2025

Submitted by

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Appendix

1. Project Overview

The purpose of this report is to encapsulate the documents and analysis required by the Drainage Review as defined by KMC 15.52.050 in accordance with the 2021 King County Surface Water Design Manual (KCSWDM) and the City of Kirkland Addendum to the King County Washington Surface Water Design Manual (Kirkland Addendum), the King County Stormwater Prevention Manual (KCSPPM), and the latest edition of the LID Technical Guidance Manual for the Puget Sound (LID Manual), for the proposed 9 lot short plat.

Existing Site:

The proposed Park Heights Short Plat project site is in Section 30, Township 26 N, Range 05 E, W.M., situated on four separate parcels, Parcel # 9194100760, -0790, -0840, and -0890. The site is north of 89th Place NE and NE 121st Street, an unopened public Right-of-Way. The parcels are within the Residential Comprehensive Plan Designation and zoned Low Density Residential (RSA-4).

The project site is generally undeveloped with land cover that is predominately forested. A small portion of Parcel #9194100890 at the south end contains pavement associated with 89th Place NE which is located within an ingress, egress and utilities easement. The site also contains a few trails and dirt roads which meander through the property. Two areas of wetland have been delineated onsite by the project biologist. This includes a larger portion of wetland at the southeastern end of the site and small portion of wetland at the northeastern end of the site. Grades across the project site range from 1 to 60 percent down from west to the east and a vertical relief of approximately 112 feet.

Refer to Figures 1.2 and 1.3A for a vicinity map and a visual representation of the existing site conditions.

Proposed improvements:

The short plat infrastructure improvements include new internal roadway, private tracts, associated utilities, and landscaping.

Stormwater will be conveyed and collected by a series of pipes and catch basins. A stormwater facility is proposed to meet flow control requirements conditioned with this project. The stormwater facility will consist of an underground infiltration system for mitigation of most runoff generated from the project's target surface areas.

The infiltration facility will be preceded by a proprietary media filter device to treat stormwater prior to infiltration. See section 4 of this report for a further discussion of the existing and proposed hydrology and design details.

Critical Areas

Wetlands:

A Critical Area Study and Buffer Averaging Plan for Wu Property-89th Place NE, dated June 18, 2024, was prepared by Wetland Resources, Inc. In summary, using current wetland delineation methodology, two wetlands were identified and delineated within the project limits. This includes two category III slope wetlands (Wetlands A and B) which are subject to a 60-foot buffer width. An off-site Type Ns stream was also identified near Wetland B and is hydraulically connected to the wetland. The associated 50-foot buffer for this stream does not extend beyond the buffer for Wetland B.

Refer to the Critical Area Study and Buffer Averaging Plan by Wetland Resources which has been included as a part of the submittal package to the city.

Geotechnical:

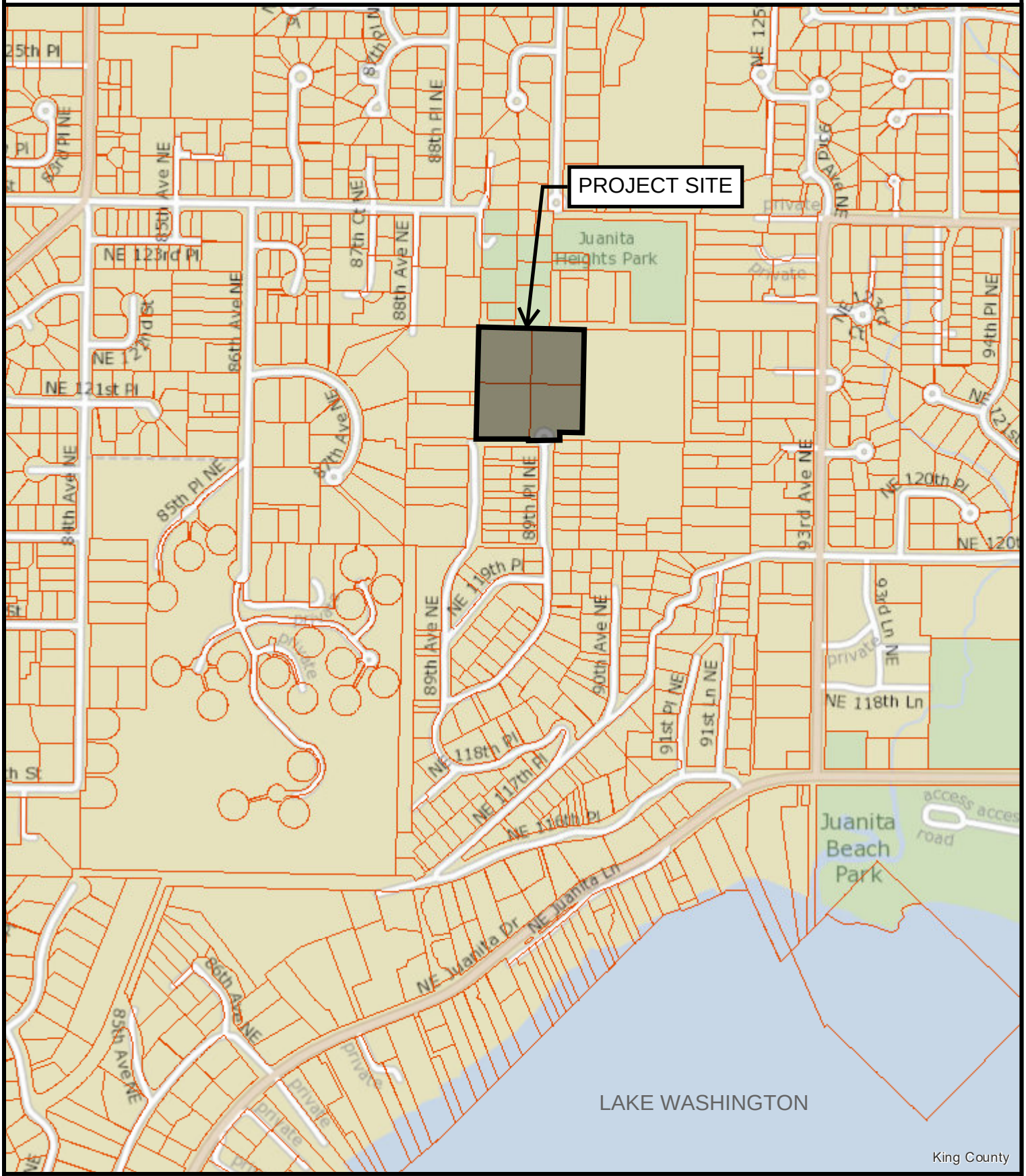
A Geotechnical Report has been completed by Terra Associates, Inc., dated December 29, 2023. A total of seven exploration pits were dug across the project site by Terra Associates, including one at the location of the proposed infiltration facility. See Figure 2 in the Geotechnical and Infiltration Report (Appendix B) provided by Terra Associates for test pit locations.

In summary, topsoil (where encountered) generally extended to depths ranging from one to ten inches below ground surface. Underlying the topsoil, native soils were encountered consisting primarily of advanced outwash soil types. Advanced outwash soils consist of uniform sand and/or gravel deposits. Test Pits exploration depths ranged between 8 to 10.5 feet below existing surface grades. The underlying soils encountered in the pilot infiltration test pit (PIT-1) near the proposed infiltration facility consist of outwash sand and sand with silt deposits observed at depths of about two to four feet below existing grade. The outwash soils are suitable for infiltration based on the results of the pilot infiltration test. A design infiltration rate of 3.49 inches per hour is recommended for sizing of the infiltration facility.

Figure 1.1 – TIR Worksheet

(A TIR Worksheet will be provided at the time of Land Surface Modification Permit submittal)

Figure 1.2 - Vicinity Map



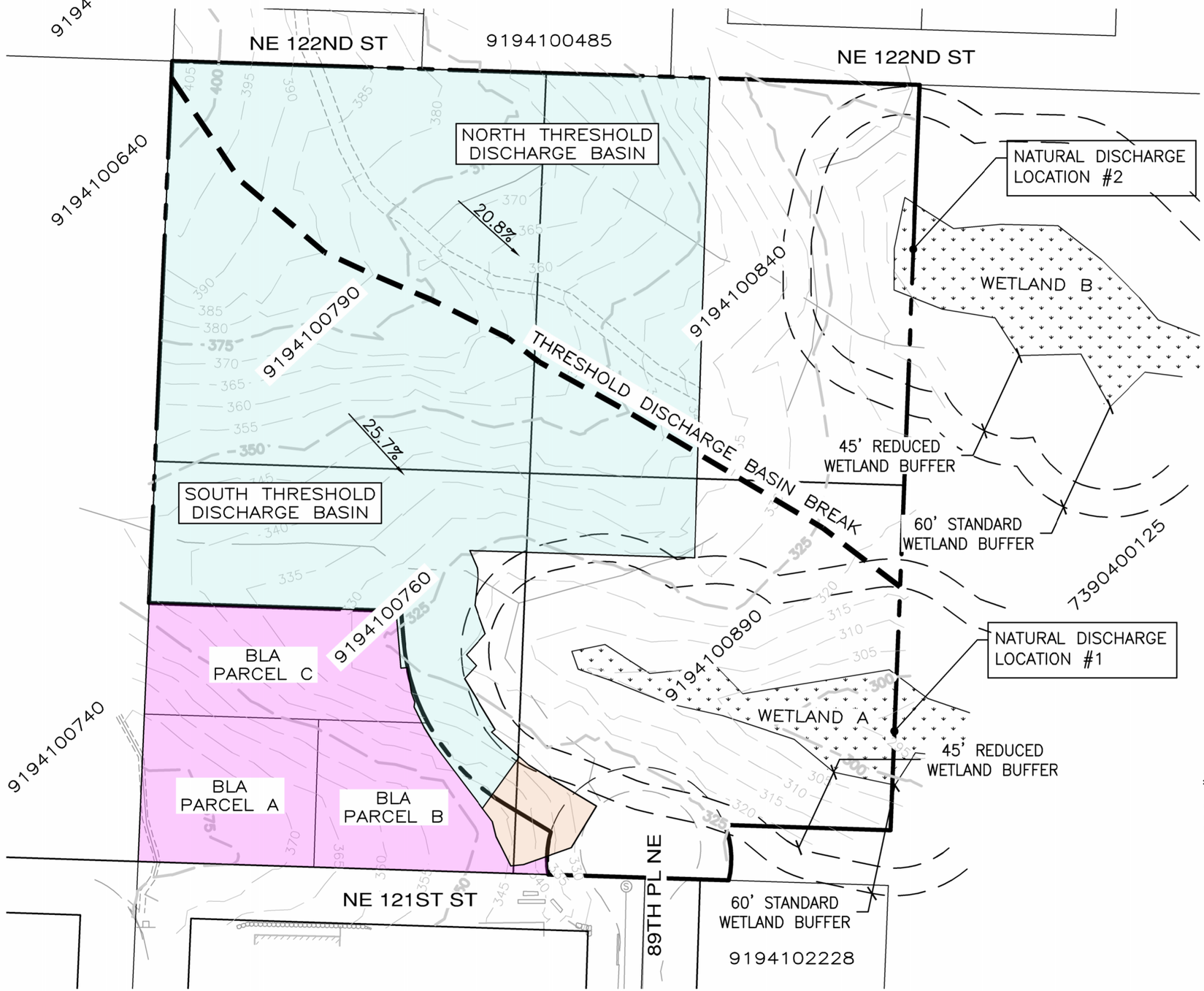
N

King County

Date: 3/6/2025 Notes:

PRE-DEVELOPED BASIN MAP

PARCELS # 9194100760, -0790, -0840, -0890



n

SCALE: 1" = 60'

0 30 60

LEGEND

POC #1

- A/B, FOREST, MOD (INFILTRATION VAULT BASIN AREA)
- A/B, FOREST, MOD (OFFSITE INFILTRATION VAULT BASIN AREA)
- A/B, FOREST, MOD (BYPASS AREA)

NOTE: REFER TO TABLE 4.1 FOR BASIN AREAS

FIGURE 1.3A

DRAWING: DEVELOPED BASIN MAP

MONTEBANC MANAGEMENT, LLC

PARK HEIGHTS SHORT PLAT

PRE-DEVELOPED BASIN MAP

ESM CONSULTING ENGINEERS LLC
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Public Works | Project Management | Landscape Architecture

JOB NO. 2090-006-023 DATE: 3/6/2025
DRAWN: DRD SHEET 1 OF 1

File: \\esm8\ENGR\ESM-JOBS\2090\006\023\StormReport\Resources\CAD\Figure 1.3A - Pre-Dev Basin Map.dwg
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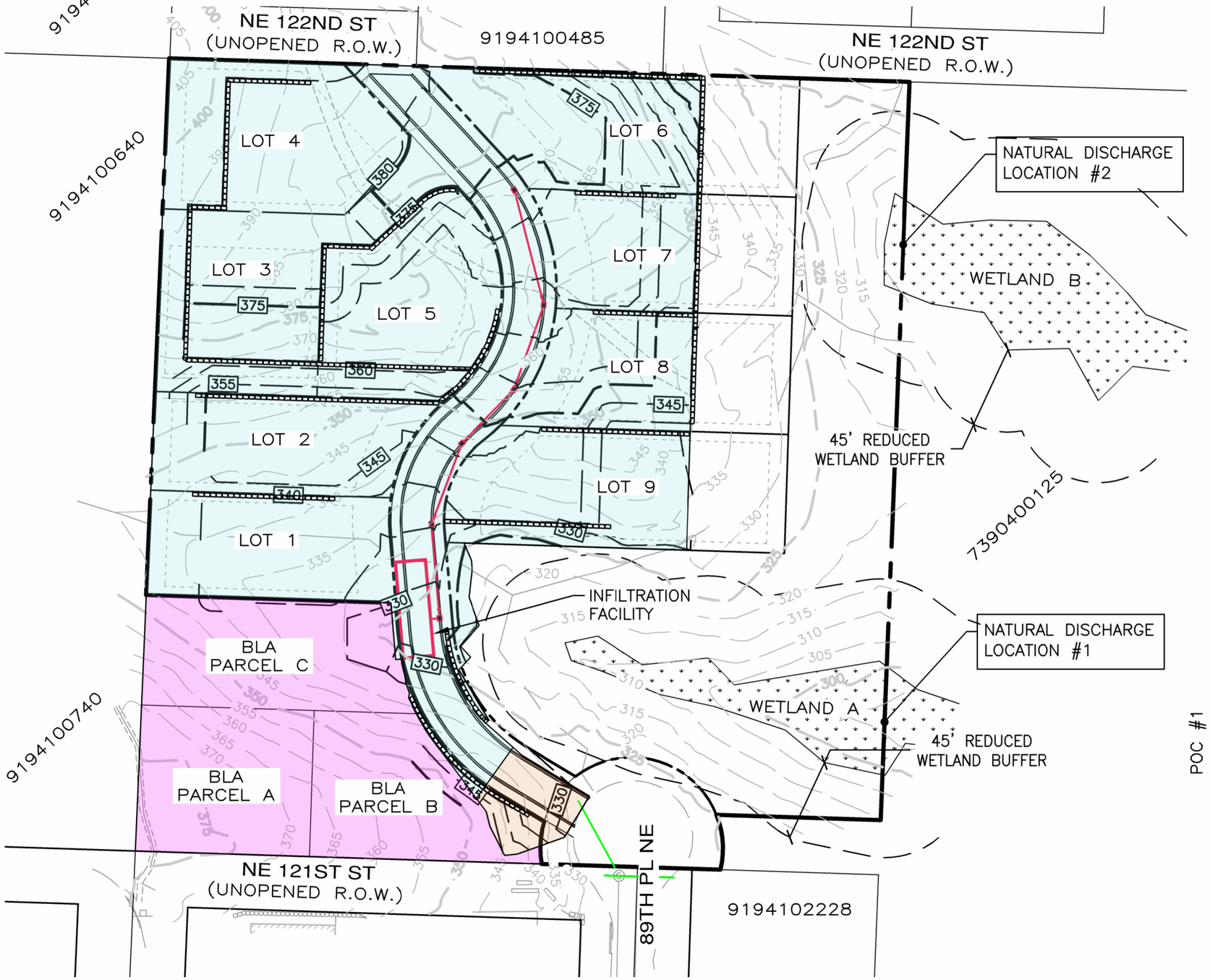
Plotted By: Dan Davis

DEVELOPED BASIN MAP

PARCELS # 9194100760, -0790, -0840, -0890



n

SCALE: 1" = 60

0 30 60

LEGEND

POC #1

- INFILTRATION VAULT BASIN AREA*
- OFFSITE INFILTRATION VAULT BASIN AREA*
- MITIGATED BYPASS AREA

*ROOFTOP AREAS ASSUMED TO INFILTRATE ONSITE

NOTE: REFER TO TABLE 4.2 FOR DEVELOPED ONSITE AND OFFSITE BASIN AREAS

FIGURE 1.3B

DRAWING: DEVELOPED BASIN MAP

MONTEBANC MANAGEMENT, LLC

PARK HEIGHTS SHORT PLAT

DEVELOPED BASIN MAP

ESM CONSULTING ENGINEERS LLC
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Civil Engineering | Land Surveying | Land Planning
Public Works | Project Management | Landscape Architecture

JOB NO. 1912-008-021 DATE: 5/17/2022
DRAWN: SHEET 1 OF 1

File: \\esm8\ENGR\ESM-JOBS\2090\006\023\StormReport\Resources\CAD\Figure 1.3B - Developed Basin Map.dwg
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Plotted By: Don Davis

FIGURE 1.4 - SOILS MAP (1 of 3)

Custom Soil Resource Report

Soil Map

FIGURE 1.4 - SOILS MAP (2 of 3)
Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: King County Area, Washington
Survey Area Data: Version 20, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AgC	Alderwood gravelly sandy loam, 8 to 15 percent slopes	0.1	2.1%
AgD	Alderwood gravelly sandy loam, 15 to 30 percent slopes	4.5	97.9%
Totals for Area of Interest		**4.6**	**100.0%**

2. Conditions and Requirements Summary

The proposed project is subject to Drainage Review and results in more than 2,000 sf of new impervious surface according to KMC 15.52.050. This review includes KCSWDM's Full Drainage Review, Core Requirements 1-9, and Special Requirements 1-5.

Review of the 9 Core Requirements and 5 Special Requirements

This section describes how the project will meet the KCSWDM Core and Special Requirements.

Core Requirement No. 1 Discharge at the Natural Location

The project site, located on 4 parcels, has two natural discharge locations and two threshold discharge areas. The site naturally slopes from west to east and due to the composition of the underlying soils on the site, most stormwater runoff is believed to fully infiltrate on-site. Similarly, all surface runoff generated from the developed basin will continue to infiltrate on-site. The proposed infiltration facility will infiltrate all surface water runoff from new developed surface areas resulting in a reduction of potential downstream flooding. If the infiltration facility were to fail, overflow will be conveyed with a 12-inch diameter pipe to a dispersion trench located downstream of the facility to the natural discharge location near the southeast corner for the site.

Core Requirement No. 2 Off-site Analysis

An off-site analysis has been documented in Section 3 of this report.

Core Requirement No. 3 Flow Control

The site is located within a Conservation Flow Control Area requiring at minimum Level 2 flow control standards per Section 1.2.3.1.B of the KCSWDM and the City of Kirkland's Flow Control Map. The flow control standard will be met using an underground infiltration facility.

Refer to Section 4 of this report for further discussion of flow control for the proposed development.

Core Requirement No. 4 Conveyance System

The new conveyance network will be analyzed and designed with sufficient capacity to convey and contain the 25-year peak flow. Events that exceed the 25-year event that may over top the system structure will be contained within the public right-of-way. The conveyance analysis will be included with the TIR at the time of Land Surface Modification Permit submittal.

Core Requirement No. 5 Erosion and Sediment Control

Erosion and sediment control to prevent the transport of sediment from the project site to downstream drainage facilities, water resources, and adjacent properties will be provided on the construction plans and discussed in the Erosion and Sediment Control Report. A Construction Stormwater Pollution Prevention Plan (CSWPPP) will be provided at the time of Land Surface Modification Permit submittal.

Core Requirement No. 6 Maintenance and Operations

The Operations and Maintenance manual will be provided at the time of Land Surface Modification Permit submittal.

Core Requirement No. 7 Financial Guarantees and Liability

All drainage facilities constructed or modified for projects will comply with the financial guarantee requirements as provided in the City of Kirkland's Bond Quantities Worksheet. Bond Quantities will be provided at the time of Land Surface Modification Permit submittal.

Core Requirement No. 8 Water Quality

All projects within the city are initially subject to the Enhanced-Basic treatment standard unless otherwise exempt according to Section 1.2.8.1 of the SWDM upon which the treatment standard may be reduced to Basic. Basic treatment may be allowed for lower density developments resulting in less than 8 du/acre. The Park Heights Short Plat is zoned RSA-4 resulting in approximately 4 dwelling units per acre. As a result, at a minimum, the site is subject to Basic Treatment. A proprietary media filter will be provided upstream of the stormwater infiltration facility to meet the Basic Treatment Standard prior to infiltration. Refer to Section 4 of this report for further detail.

Core Requirement No. 9 Flow Control BMP's

All applicable Flow Control BMP's requirements are listed and discussed in Section 4.F of this report.

Special Requirement No. 1 Other Adopted Area-Specific Requirements

There are no master drainage plans, basin plans, salmon conservation plans, stormwater compliance plans, flood hazard reduction plan updates, or shared facility drainage plans for this project. Special Requirement No. 1 does not apply.

Special Requirement No. 2 Flood Hazard Area Delineation

The site falls outside of the 500-year flood plain and located in an area of minimal flood hazard according to FEMA FIRM Map Number 53033C0355G.

Special Requirement No. 3 Flood Protection Facilities

The developed project site is not protected by an existing flood protection facility. The proposed site improvements do not include the modification of an existing flood protection facility. Special Requirement No. 3 does not apply.

Special Requirement No. 4 Source Control

The site is a residential development and is not subject to this requirement. Special Requirement No. 4 does not apply.

Special Requirement No. 5 Oil Control

The project does not have a "high-use site" characteristic and is not a redevelopment of a high-use site. Special Requirement No. 5 does not apply.

A "high-use site" is a commercial or industrial site that typically generates or is subject to runoff containing high concentrations of oil due to high traffic turnover, on-site vehicle or heavy or stationary equipment use, or the frequent transfer of liquid petroleum or coal derivative products.

3. Level 1 Off-Site Analysis

This narrative is to provide a Level 1 Downstream Analysis for the proposed Park Heights Short Plat development per Core Requirement #2, Section 1.2.2 of the 2021 King County Surface Water Design Manual (SWDM). The analysis is to identify and evaluate offsite flooding, erosion, and water quality problems that may be created or aggravated by the proposed project. The primary component of this offsite analysis is the downstream corridor. The second component is to evaluate the upstream drainage system to verify any offsite run-on that may impact the project.

The following Level 1 downstream analysis is a qualitative survey of the downstream system of the project site and is composed of the following four tasks:

Task 1 – Define and map the study area
Task 2 – Downstream Resource Review for 1-mile downstream
Task 3 – Field Inspection
Task 4 – Drainage System Description and Problem Descriptions

Task 1: Study Area Definition and Maps

The project site is located within the Juanita Creek Drainage basin, within the Cedar River / Lake Washington watershed which is a part of the Cedar-Sammamish water resource inventory area (WRIA #8). The presented drainage study area is approximately a one-mile-long path encompassing the site's downstream corridor.

Refer to Figure 3.2 for a map of the basic study area.

The study area also includes a 1/4-mile downstream field investigation of stormwater released from the project site. See Figure 1.3A, Figure 3.3A and Figure 3.3B for the Existing Site Conditions and maps of the downstream corridor.

Task 2: Resource Review

Flow Control Map
According to the Kirkland Flow Control Map, the project is located within the Conservation Flow Control Area and required to comply with Level 2 Flow Control Standards.

Site Soils
Refer to the project overview in Section 1 of this report.

City of Kirkland Critical Areas Map
Properties and streams along the 1-mile downstream study area and portions of the upstream basin were researched such that offsite flooding, erosion, and water quality problems that may be created or aggravated by the proposed project can be identified and evaluated: The following items were investigated according to the available studies and the City's Critical Areas Map.

- Drainage Studies ..... None mapped
- Streams ..... None mapped
- Lakes ..... None mapped
- Potential Steep Slope Hazard ..... None mapped
- Erosion Hazard Area ..... None mapped

- Landslide Hazard Area..... Site contains mapped Landslide Hazard Areas. Refer to geotechnical report for the Landslide Hazard Areas discussion
- FEMA Floodway or Floodplain ..... None mapped

100 Year Floodplain

The Federal Emergency Management Agency prepared maps for all areas within the City of Kirkland. These maps can be found on the FEMA website. Panel #53033C0355G, effective 085/19/2020 depicts the areas, if any, subject to flooding in the vicinity of this project. By inspection of this map, the project is located in Zone X, which is designated as areas outside the 0.2 percent annual chance floodplain.

The site falls outside of the 500-year flood plain and located in an area of minimal flood hazard according to FEMA FIRM Map Number 53033C0355G.

Wetlands

A Critical Area Study and Buffer Averaging Plan for Wu Property-89th Place NE, dated June 18, 2024, was prepared by Wetland Resources, Inc. In summary, using current wetland delineation methodology, two wetlands were identified and delineated within the project limits. This includes two category III slope wetlands (Wetlands A and B) which are subject to a 60-foot buffer width. An off-site Type Ns stream was also identified near Wetland B and is hydraulically connected to the wetland. The associated 50-foot buffer for this stream does not extend beyond the buffer for Wetland B.

Refer to the Critical Area Study by Wetland Resources which has been included as a part of the submittal package to the city.

Downstream Drainage Complaints

Research of relevant drainage complaints within the downstream corridor is currently on going. When the data becomes available from the city, it will be added to this report as applicable.

Water Quality Assessment

The Department of Ecology Water Quality Assessment 303(d)/305(b) lists were reviewed to see if there are any known downstream water quality concerns. Waters whose beneficial uses are impaired by pollutants that require a water improvement project are placed in the polluted water category (Category 5) and put on the 303(d) list. The 305(b) lists all waters and all categories. Pollutants of concern could be Bacteria, Dissolved oxygen, temperature, metals, phosphorus, turbidity, or high pH.

From the site, surface water runoff is tributary to Juanita Creek which is located approximately 0.45 miles downstream. According to the DOE Draft Water Quality Atlas, Juanita Creek is a Category 5 polluted water body. Impairments include temperature, dissolved oxygen, and bacteria.

Refer to Figure 3.1 at the end of this section of the DOE 303(d) water quality assessment map.

Designated water quality problems

There are no designated water quality problems known at this time.

Task 3: Field Inspection (Level 1 Inspection)

A site study was conducted by ESM Consulting Engineers for the purpose of analyzing the project site and its upstream and downstream corridors. A description of the drainage path is provided below.
Refer to Figures 3.3A and 3.3B at the end of the downstream analysis for maps of the downstream reach and point locations.

Upstream and onsite runoff
Based on upstream topography, the parcels located west of the project site appear to drain to the site. Runoff from this upstream area would likely disperse and infiltrate through the native growth ground coverage located on these western parcels. Further analysis of any upstream runoff will be conducted during final engineering and if necessary, routed around the project site to a downstream wetland at the eastern property boundary.

We acknowledge that upstream runoff conditions will be further evaluated. During the LSM phase, provide documentation assessing how much flow is needed to maintain wetland hydrology and function and how that flow will be provided. If the proposed approach is to route upstream flow toward the wetland, a geotechnical evaluation will be required to demonstrate that this flow can be safely conveyed on steep slope, especially through the mapped landslide hazard area, and to show that no adverse impacts will occur.

Natural Discharge #1 Downstream Corridor
The first natural discharge location is located nea
is also the location of the proposed infiltration vau

Reach 1A: Stormwater discharges the site to
coverage near the southeast corner o

Reach 1B: Site runoff is conveyed through a dra

Reach 1C: Site runoff reaches a paved street
connected to a 12" storm pipe. The 1
93rd Ave NE.

Reach 1D: Site runoff enters a catch basin at th
is conveyed south along an 18" storm pipe until discharging into a ditch at the south
end.

Reach 1E: Site runoff drains south along a roadside ditch on the west side of 93rd Ave NE and reaches a point located one-quarter mile downstream where the downstream analysis was concluded.

Natural Discharge #2 Downstream Corridor
The second natural discharge location is located near the northeast corner of the project site.

Reach 2A: Stormwater discharges the site to an area consisting of wetland and forest coverage near the northeast corner of the site and is conveyed east and southeast.

Reach 2B: Site runoff is conveyed east along grass coverage toward 93rd Ave NE.

Reach 2C: Site runoff reaches a paved street (93rd Ave NE) and flows south along the street until reaching a storm catch basin.

Reach 2D: Site runoff enters a catch basin on the west side of 93rd Ave NE and is conveyed south through a 12" storm pipe until reaching a point located one-quarter mile downstream where the downstream analysis was concluded.

Task 4: Drainage Description and Problem Descriptions

The downstream drainage systems are largely comprised of dense forest coverage, established lawn, and an underground pipe system. See Task 3 for a narrative of the downstream flow paths for a quarter mile downstream of each natural discharge location from the site and for a description of each reach.

Downstream Drainage Problems

There are no known or observed conveyance system nuisance problems, severe erosion, or flooding problems.

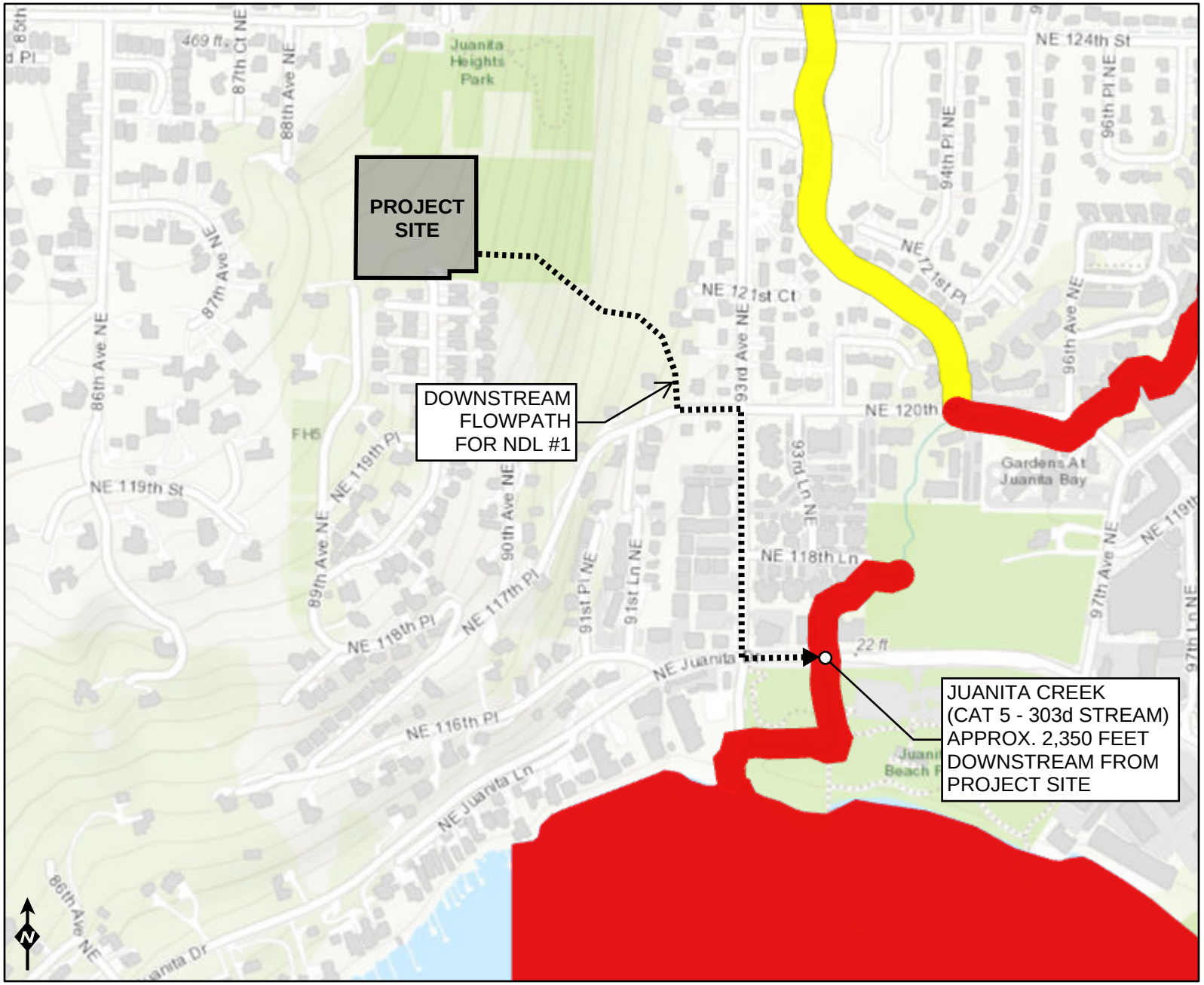
Downstream Water Quality Problems

As discussed in Task 2 of the Offsite Analysis, Juanita Creek is downstream of the site and impaired due to temperature, dissolved oxygen, and bacteria. The Creek is located approximately 0.45 miles downstream of the project site. This potential water quality problem is beyond the one-quarter mile threshold to warrant mitigation as suggested in the KCRSWDM Section 1.2.2.3. See Figure 3.1 below for a map of the classified 303(d) areas downstream of the project site.

Offsite analysis requires photos taken onsite (not Google Street View) to within 1/4-mile downstream of site discharge point to assess downstream condition. (Policy D-10, 1.2.2)

March 7, 2025

Figure 3.1 - 303d Polluted Waters



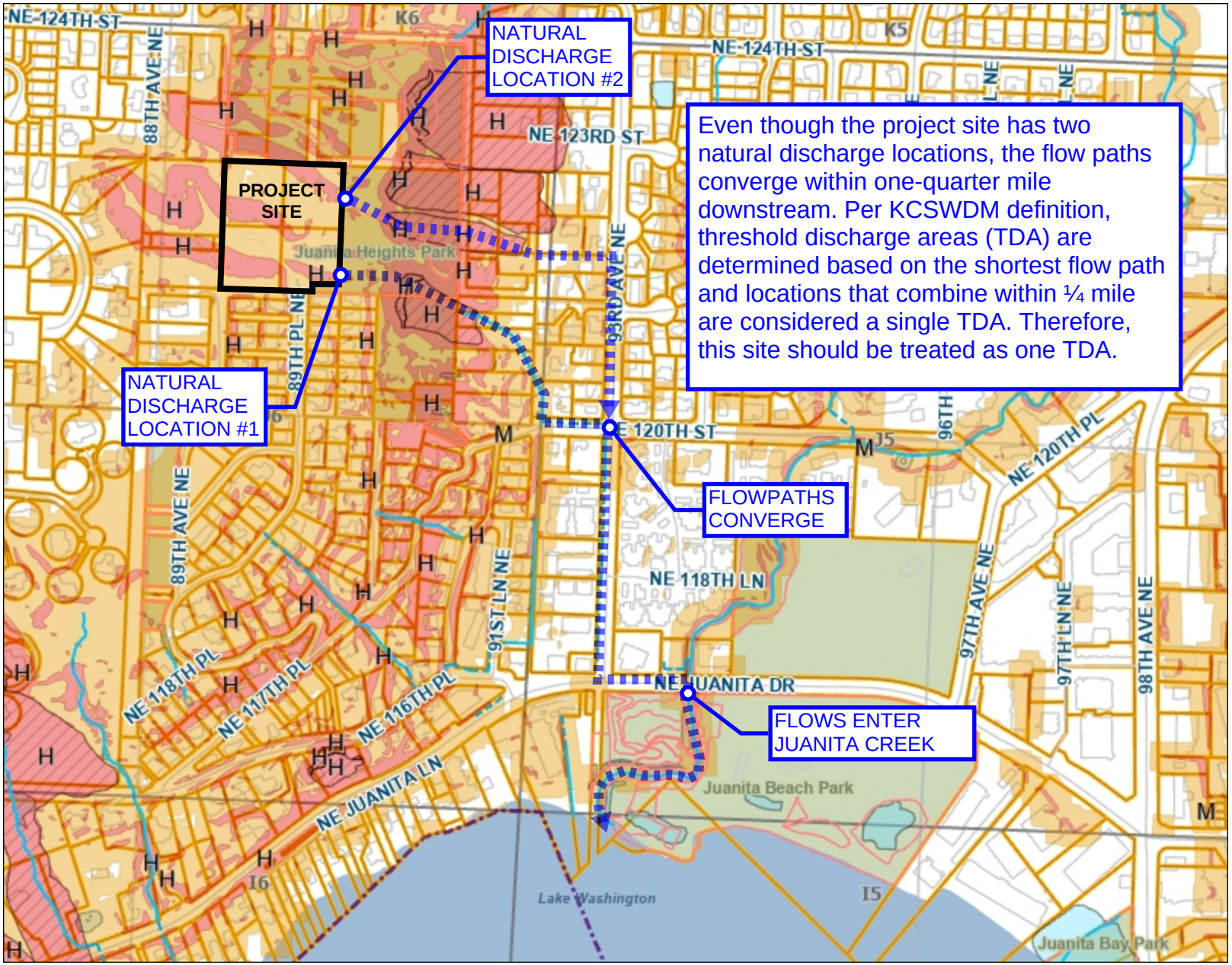
Assessed Water/Sediment

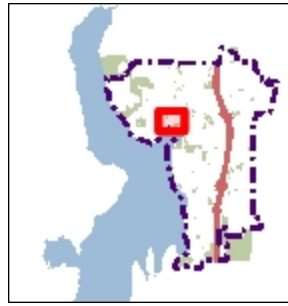
Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Esri, NASA, NGA, USGS, FEMA
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri

City of Kirkland GIS





Legend

- Streams
  - Open
  - Pipe
- Restoration Management Unit
- Floodplain
- Landslide
  - Deposit Areas
  - Head Scarps
  - High Susceptibility
  - Moderate Susceptibility
- Wetlands
- City Limits
- Grid
- QQ Grid
- Regional Rail Corridor
- Cross Kirkland Corridor
- Streets
- Parcels
- Buildings
- Lakes
- Parks
- Schools

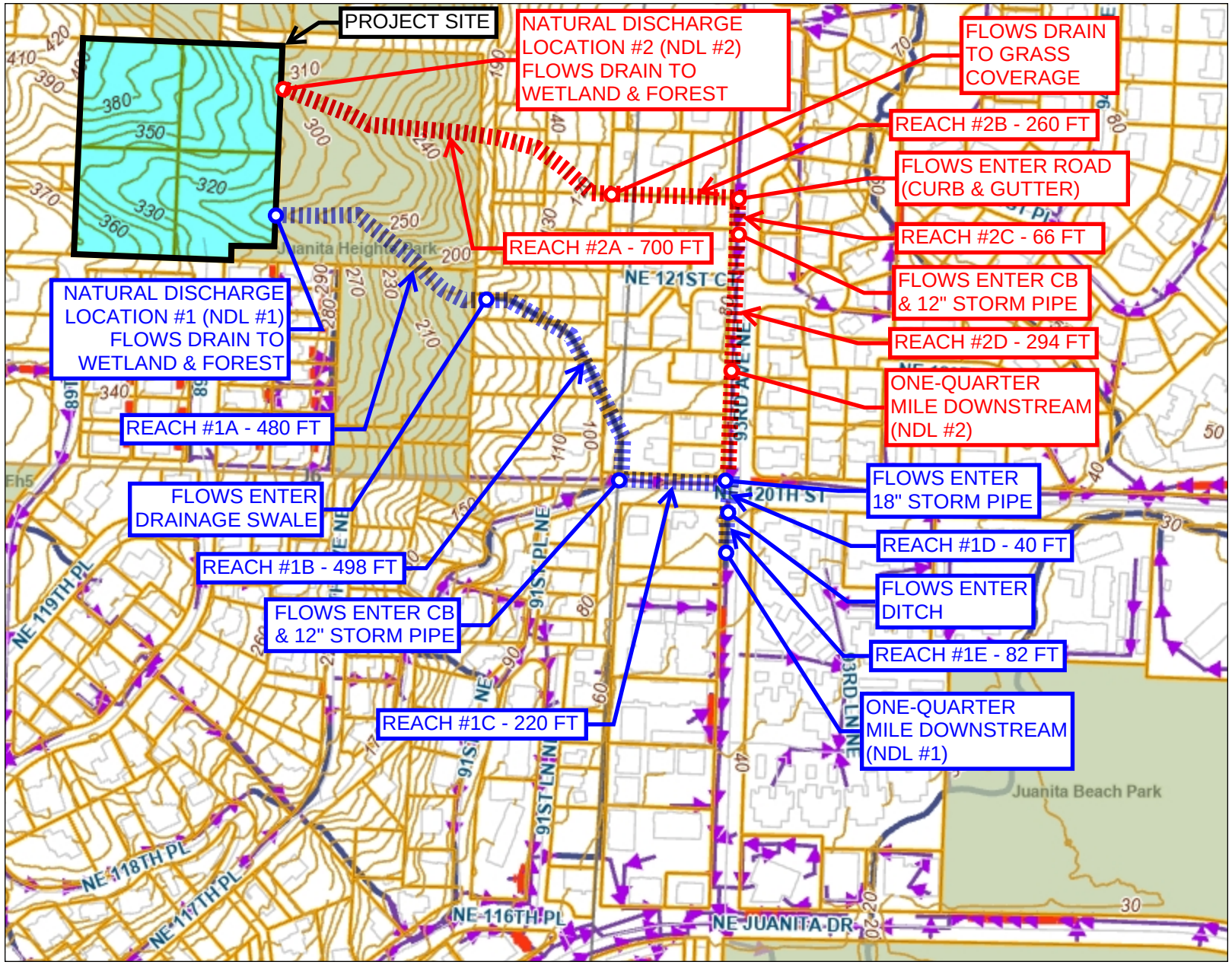
1: 6,000

Notes

0.2 0 0.09 0.2 Miles

NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet

FIGURE 3.3 - DOWNSTREAM CORRIDOR



Legend

- Contours 10 Feet
- City Limits
- Grid
- QQ Grid
- Regional Rail Corridor
- Cross Kirkland Corridor
- Streets
- Parcels
- Buildings
- Lakes
- Parks
- Schools
- Olympic Pipeline Corridor
- Storm Pipe Flow Dir
- Pipes Tanks Etc
  - SW Pipe
  - SW Tank or Vault
- Stream Ditch Etc

1: 3,530

Notes

0.1 0 0.06 0.1 Miles

NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet

4. Flow Control & Water Quality Facility Analysis and Design

4.1 Existing Site Hydrology (North and South Threshold Discharge areas combined)

Much of the existing project site is vegetated with dense forest vegetation and ranges in grades between 1 and 60 percent. Onsite stormwater runoff sheet flows across the property through the native vegetation toward the eastern property boundary.

Potential upstream runoff, if necessary, will be routed around the site and bypass the infiltration facility.

4.2 Developed Site Hydrology (North and South Threshold Discharge areas combined)

In summary, the project proposes to construct a series of catch basins and pipe that will collect and convey stormwater runoff to a new onsite infiltration facility located in the southern region of the project site. The infiltration facility will infiltrate nearly all runoff from developed surface areas.

The following tables represent the pre-developed and developed conditions for the project.

Table 4.1 – Historic Conditions (POC #1)

Threshold Discharge Area #1				
Area	A,B Forest, Moderate sf (ac)	A,B, Lawn Flat sf (ac)	Imperv., Flat sf (ac)	Total sf (ac)
Infiltration Facility Basin	124,319 (2.854)	0	0	124,319 (2.854)
Offsite (Bypass)	1,552 (0.036)	0	0	1,552 (0.036)
Total Project Site	**125,871 (2.890)**	**0**	**0**	**125,871 (2.890)**

*Area is equal to the limits of construction under developed conditions for surfaces considered 'New' or 'Replaced'. Future development areas have been estimated and are also included in facility sizing.

The site's mapped soil (AgC, AgD) is identified as Hydrologic Soil Group C (till). Revise to use Soil Type C to accurately represent site conditions. The average slope for the site is shown to be greater than 15%, indicate steep slope condition.

The project site is located within the Goat Hill (GH) overlay zone, which per KZC 71.15 limits maximum impervious coverage to 40% of the total lot area. In accordance with Policy D-10, an additional 10% impervious area should be added. Therefore, the total assumed impervious coverage should be 50% for design evaluation. Revise area calculation.

Table 4.2 – D

Area	Impervious sf (ac)		sf (ac)	(ac)	
Infiltration Vault Basin					
Lots 1-9*	9,000 (0.207)	75,558 (1.735)	0	0	84,558 (1.942)
BLA Lots A, B, & C	3,000 (0.069)	21,017 (0.482)	0	0	24,017 (0.551)
ROW/Tracts (100% Impervious)	15,744 (0.361)	0	0	0	15,744 (0.361)
Total Area	**27,744 (0.637)**	**96,575 (2.217)**	**0**	**0**	**124,319 (2.854)**
Bypass Basin					
ROW	0	0	1,552 (0.036)	0	1,552 (0.036)
Parcels	0	0	0	865 (0.020)	865 (0.020)
Total Area	**0**	**0**	**1,552 (0.036)**	**865 (0.020)**	**2,417 (0.056)**
Total					
Project Total (POC #1)	**27,744 (0.637)**	**96,575 (2.217)**	**1,552 (0.036)**	**865 (0.020)**	**126,736 (2.910)**

*1,000 sf of future driveway area per lot assumed to drain to the infiltration vault. Future rooftop areas will be infiltrated on-site with infiltration BMPs for each lot to be designed at the time of building permit application.

Table 4.3 – Pre- and Post-Developed Peak Discharge Flows (POC #1)

Storm Recurrence Event	Pre-Developed (cfs)	Developed (cfs)
2-Year	0.003	0.014
10-Year	0.006	0.020
25-Year	0.008	0.024
50-Year	0.010	0.027
100-Year	0.013	0.030

4.3 Performance Standards

Flow Control (Sec 1.2.3.2 SWDM)

The site is located within a Conservation Flow Control Area requiring at minimum Level 2 flow control standards per Section 1.2.3.1.B of the KCSWDM and the City of Kirkland's Flow Control Map.

The flow control standard will be met using an infiltration vault. By retaining mostly all stormwater from the site's target surfaces, the developed (discharge) flow rates are greatly reduced where the flow control facility requirement can be waved according to Section 1.2.3.1.C of the manual.

Due to the limited increase in developed stormwater flow rates a flow control exception can be applied to this project. The required flow control facility can be waived for any threshold discharge area in which there is no more than a 0.15-cfs difference in the sum of the developed 100-year peak flows for those target surfaces and the sum of the historic site conditions. A stormwater analysis of the respective target surfaces for this project indicate there will be less than 0.15-cfs increase from predeveloped to developed conditions.

Onsite Unmitigated Flow Control Target Surface Bypass (Sec 1.2.3.2.E SWDM)
On some sites, topography can make it difficult or costly to collect all target surface runoff for discharge to the onsite flow control facility. Therefore, Section 1.2.3.2.E of the SWDM allows for some project runoff subject to flow control to bypass the flow control facility provided that all of the following conditions are met:

1) *The point of convergence for runoff discharged from the bypassed target surfaces and from the project's flow control facility must be within a quarter-mile downstream of the facility's project site discharge point.*

   Response: Project bypass flows will continue to discharge at its natural discharge location.

2) *The increase in the existing site conditions 100-year peak discharge from the area of bypassed target surfaces must not exceed 0.4 cfs.*

   Response: The increase in existing site conditions is less than 0.4 cfs.

3) *Runoff from the bypass target surfaces must not create a significant adverse impact to downstream drainage systems, salmonid habitat, or properties as determined by the County.*

   Response: A significant adverse impact to the downstream drainage system is not anticipated as the downstream conveyance system is a tightline for at least a quarter-mile downstream.

4) *Water quality requirements applicable to the bypassed target surfaces must be met.*

   Response: Applicable water quality requirements have been met. See the Water Quality performance standard in this section.

5) *Compensatory mitigation by a flow control facility must be provided so that the net effect at the point of convergence downstream is the same with or without the bypass. This mitigation may be waived if the existing site conditions 100-year peak discharge from the area of bypassed target surfaces is increased by no more than 0.15 cfs and flow control BMPs as detailed in Appendix C of the SWDM are applied to all impervious surfaces within the area of bypassed target surfaces.*

   Response: Compensatory mitigation is not applicable. The project does not increase the 100-year peak discharge by more than 0.15 cfs. Refer to Table 4.3 historic and developed discharge flow rates.

Water Quality (Sec 1.2.8.1 SWDM & 1.2.8.2.D)
Stormwater treatment is required for this project as a result of exceeding the 5,000 sf PGIS site area threshold to provide a water quality benefit to stormwater coming in contact with pollution generating impervious surfaces (PGIS) prior to discharging from the project site.

All projects with the city are initially subject to the Enhanced-Basic treatment standard unless otherwise exempt according to Section 1.2.8.1 of the SWDM upon which the treatment standard may be reduced to Basic. The goal for this level of treatment is 80% removal of total suspended solids (TSS) for flows or volumes up to and including the Water Quality design flow or volume for a typical rainfall year.

Basic treatment may be allowed for lower density developments resulting in less than 8 du/acre. The Park Heights short plat is zoned RSA–4 resulting in approximately 4 dwelling units per acres. As a result, the site, at a minimum, the site is subject to basic treatment.

To accomplish the treatment standard, a volume-based facility is proposed as selected from the Basic Water Quality menu in Section 6.1.1 of the SWDM. A proprietary media filter system is proposed to meet this standard and details have been provided in the water quality section below.

Runoff from nearly all the target, impervious surfaces will be treated to basic treatment standards. However, site topographic constraints limit the potential for stormwater treatment of the bypass area within the a portion of the new 89th Pl NE right-of-way. For this situation, Section 1.2.8.2.D of the SWDM allows for the release of untreated discharges when there are topography constraints provided that all of the following conditions are met:

1) *Treatment of the constrained area by filter strip, bioswale, or a linear sand filter is not feasible, and a treatment trade is not possible.*

Response: The PGIS surfaces within the bypassed area consist of the 89th Pl NE roadway, a public right-of-way. Filter strips, bioswale, or a linear sand filter is not feasible to treat stormwater from this area.

2) *The untreated target surface is less than 5,000 sf of new plus replaced PGIS.*

Response: Less than 5,000 sf of new plus replaced PGIS (Approx 1,552 sf as summarized in Table 4.2 on the previous pages) will bypass untreated.

3) *Any target PGPS within the area to be released untreated shall be addressed with a landscape management plan.*

Response: Pollution Generating Pervious Surfaces are not proposed.

4.4 Flow Control System

Infiltration Facility Basin (POC #1)
The flow control system proposed is an infiltration facility designed to mitigate runoff generated from the project per the requirements of the Manual as discussed in Section 2 of this report, Minimum Requirement #3. The proposed infiltration facility has been designed based on the design criteria and methods of analysis found in Section 5.2.4 of the SWDM.

Design Criteria

The size of the infiltration vault was determined by routing the influent runoff file generated by the continuous runoff model through the proposed infiltration vault element. The infiltration vault will have an open bottom to allow for full infiltration into the permeable soils below. The vault also will be provided with an emergency overflow pipe system to allow for discharge of any overflow that may occur if the capacity of the infiltration vault is exceeded.

Table 4.4 below summarize the input values used to evaluate the proposed infiltration vault.

Table 4.4 Infiltration Vault Parameters

Parameter	WWHM Input	Proposed
Length	52 ft	52 ft
Width	16 ft	16 ft
Bottom Square footage	832 sf	832 sf
Storage Depth	8 ft	8 ft
Effective Depth	9 ft	9 ft
Total Storage	6,656 cf 0.153 ac-ft	6,656 cf 0.153 ac-ft
Design Infiltration Rate	3.49 in/hr	3.49 in/hr
Percent Infiltrated	100%	100%

Infiltration is not allowed within the Goat Hill Overlay Zone per City policy due to slope instability and geotechnical constraints

Pretreatment

A basic treatment facility per Section 6.5.1 of the KCSWDM is proposed upstream of the infiltration facility to filter out a portion of the suspended solids from the influent. Further discussion and analysis of the treatment facilities are provided in the Water Quality analysis in this section.

Overflow Downstream Pipe Conveyance

Storm overflow from the infiltration vault will be conveyed downstream to a dispersion trench with a new overflow pipe conveyance system. The capacity of the overflow pipe will be designed to convey the 100-year developed peak flow. Further details will be provided in the TIR at the time of Land Surface Modification Permit submittal.

4.5 Water Quality System:

As discussed in Section 4.3, Basic water quality treatment standards apply to this project. Stormwater runoff from pollution generating surfaces will be treated using a proprietary media filter system will be used for treatment. The water quality basin has the same contributing tributary area as the infiltration facility as provided in Table 4.2 and Table 4.5. Also see the WWHM Analysis located in Appendix 'A'.

A Contech StormFilter with ZPG media is proposed to provide stormwater treatment for the project in accordance with Reference 14-A of the SWDM. Further details will be provided in the TIR at the time of Land Surface Modification Permit submittal.

4.6 Flow Control BMPs (Core Requirement #9):

On-Site BMPs were evaluated for the project site as outlined in the KCSWDM under Section 1.2.9.1.D.3 – subdivision projects on sites less than 5 acres in size OR within the UGA. Target

surfaces for application of Core Requirement #9 include new impervious surfaces, new pervious surface, and replaced impervious surfaces.

Implementation of flow control BMPs will be deferred until a permit is obtained for construction on each lot. The infiltration vault has been sized to accommodate 1,000 square feet of future impervious driveway area for each lot.

The BMP's required for the plat infrastructure per KCSWDM Section 1.2.9.4 (e.g. road and sidewalk etc.) are described in order of precedence below with feasibility determined.

Requirement #1

Full Dispersion (Section C.2.1) has been evaluated for the project site. There is insufficient flow path available on ground slopes of 15% or less to which target impervious surfaces may be dispersed. Therefore, minimum design requirement #1 (specified in Section C.2.1.1) cannot be met; hence, this BMP is infeasible for the project site.

Requirement #2

Full Infiltration (Section C.2.2 or Section 5.2, whichever is applicable) has been evaluated. A Geotechnical Report has been prepared by Terra Associates, dated December 29, 2023. The underlying soils are outwash soils suitable for infiltration. Infiltration has been proposed as the main method of stormwater management for the project, with the exception of select areas that are difficult to route to the infiltration facility due to topographic limitations. This includes runoff from the road extension for 89th Pl NE.

Requirement #3

Further BMP requirements are not applicable for the shot plat infrastructure. Refer to Requirement #2.

Requirement #6

All new pervious surfaces will be amended in accordance with KCC 16.82.100(F) and (G) to satisfy the requirements specified therein (notes will be included on the final landscape plans).

5. Conveyance System Analysis and Design

Onsite Conveyance System:

Runoff from the developed project site will be collected from the developed lot lawns, roofs, and drive aisles by the proposed conveyance system located throughout the project. The proposed stormwater drainage system is composed of catch basin structures with 6-inch and 12-inch diameter pipes. A conveyance and backwater analysis will be completed to verify the capacity of the critical pipes in the system. The proposed stormwater drainage system will be designed to convey the 25-year peak flow rate generated by the developed tributary basin as required in the SWDM. Conveyance calculations will be provided with the future engineering application.

6. Special Reports and Studies

Geotechnical Study

A Geotechnical Report has been completed by Terra Associates, dated December 29, 2023. This study has been provided in Appendix B of this report.

Environmental Study

Critical Area Study and Buffer Averaging Plan for Wu Property – 89th Place NE, dated June 18, 2024, by Wetland Resources. This study has been included as a part of the submittal package to the city.

7. Other Permits

Building, water, and sewer permits will be required for this project.

8. ESC Analysis and Design

The Erosion and Sedimentation Control will be provided at the time of Land Surface Modification Permit submittal.

9. Bond Quantities, Facility Summaries, and Declaration of Covenant

The Bond Quantities worksheet will be provided at the time of Land Surface Modification Permit submittal.

10. Operations and Maintenance

The Operations and Maintenance manual will be provided at the time of Land Surface Modification Permit submittal.

Appendix A – Hydrology Model Output

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: 2025-03-11 - Park Heights

Site Name:	Park Heights Short Plat
Site Address:	
City:	Kirkland
Report Date:	3/10/2025
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2024/06/28
Version:	4.3.1

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Pre-Developed

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Mod	2.854
Pervious Total	2.854
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.854

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

The site’s mapped soil (AgC, AgD) is identified as Hydrologic Soil Group C (till). Revise to use Soil Type C to accurately represent site conditions. The average slope for the site is shown to be greater than 15%, indicate steep slope condition.

Pre-Dev Bypass

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Mod	0.056
Pervious Total	0.056

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.056

Update area, soil type and slope

Element Flow Componants:

Surface	Interflow	Groundwater

Componant Flows To:

POC 1	POC 1

Mitigated Land Use

Developed Basin

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Mod	2.217
Pervious Total	2.217

Impervious Land Use	acre
ROADS FLAT	0.637
Impervious Total	0.637
Basin Total	2.854

Element Flow Componants:

Surface	Interflow	Groundwater

Componant Flows To:

Vault 1	Vault 1

Dev Bypass

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Mod	0.02
Pervious Total	0.02

Impervious Land Use	acre
ROADS FLAT	0.036
Impervious Total	0.036
Basin Total	0.056

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width:	16 ft.	
Length:	52 ft.	
Depth:	9 ft.	
Infiltration On		
Infiltration rate:	3.49	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		101.371
Total Volume Through Riser (ac-ft.):		0
Total Volume Through Facility (ac-ft.):		101.371
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
Discharge Structure		
Riser Height:	8 ft.	
Riser Diameter:	12 in.	
Element Outlets:		
Outlet 1	Outlet 2	
Outlet Flows To:		

Vault Hydraulic Table

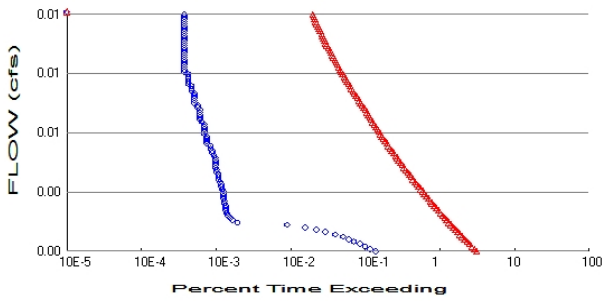
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.019	0.000	0.000	0.000
0.1000	0.019	0.001	0.000	0.067
0.2000	0.019	0.003	0.000	0.067
0.3000	0.019	0.005	0.000	0.067
0.4000	0.019	0.007	0.000	0.067
0.5000	0.019	0.009	0.000	0.067
0.6000	0.019	0.011	0.000	0.067
0.7000	0.019	0.013	0.000	0.067
0.8000	0.019	0.015	0.000	0.067
0.9000	0.019	0.017	0.000	0.067
1.0000	0.019	0.019	0.000	0.067
1.1000	0.019	0.021	0.000	0.067
1.2000	0.019	0.022	0.000	0.067
1.3000	0.019	0.024	0.000	0.067
1.4000	0.019	0.026	0.000	0.067
1.5000	0.019	0.028	0.000	0.067
1.6000	0.019	0.030	0.000	0.067
1.7000	0.019	0.032	0.000	0.067
1.8000	0.019	0.034	0.000	0.067
1.9000	0.019	0.036	0.000	0.067
2.0000	0.019	0.038	0.000	0.067
2.1000	0.019	0.040	0.000	0.067
2.2000	0.019	0.042	0.000	0.067
2.3000	0.019	0.043	0.000	0.067
2.4000	0.019	0.045	0.000	0.067
2.5000	0.019	0.047	0.000	0.067
2.6000	0.019	0.049	0.000	0.067
2.7000	0.019	0.051	0.000	0.067
2.8000	0.019	0.053	0.000	0.067
2.9000	0.019	0.055	0.000	0.067
3.0000	0.019	0.057	0.000	0.067

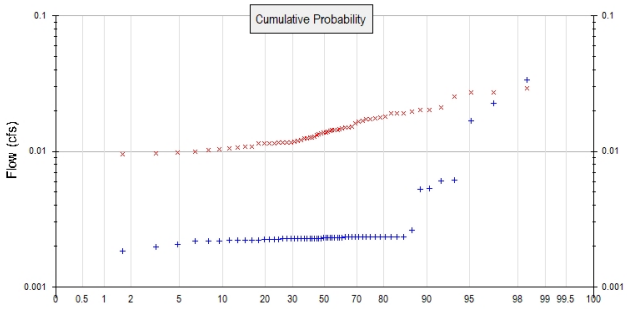
3.1000	0.019	0.059	0.000	0.067
3.2000	0.019	0.061	0.000	0.067
3.3000	0.019	0.063	0.000	0.067
3.4000	0.019	0.064	0.000	0.067
3.5000	0.019	0.066	0.000	0.067
3.6000	0.019	0.068	0.000	0.067
3.7000	0.019	0.070	0.000	0.067
3.8000	0.019	0.072	0.000	0.067
3.9000	0.019	0.074	0.000	0.067
4.0000	0.019	0.076	0.000	0.067
4.1000	0.019	0.078	0.000	0.067
4.2000	0.019	0.080	0.000	0.067
4.3000	0.019	0.082	0.000	0.067
4.4000	0.019	0.084	0.000	0.067
4.5000	0.019	0.086	0.000	0.067
4.6000	0.019	0.087	0.000	0.067
4.7000	0.019	0.089	0.000	0.067
4.8000	0.019	0.091	0.000	0.067
4.9000	0.019	0.093	0.000	0.067
5.0000	0.019	0.095	0.000	0.067
5.1000	0.019	0.097	0.000	0.067
5.2000	0.019	0.099	0.000	0.067
5.3000	0.019	0.101	0.000	0.067
5.4000	0.019	0.103	0.000	0.067
5.5000	0.019	0.105	0.000	0.067
5.6000	0.019	0.107	0.000	0.067
5.7000	0.019	0.108	0.000	0.067
5.8000	0.019	0.110	0.000	0.067
5.9000	0.019	0.112	0.000	0.067
6.0000	0.019	0.114	0.000	0.067
6.1000	0.019	0.116	0.000	0.067
6.2000	0.019	0.118	0.000	0.067
6.3000	0.019	0.120	0.000	0.067
6.4000	0.019	0.122	0.000	0.067
6.5000	0.019	0.124	0.000	0.067
6.6000	0.019	0.126	0.000	0.067
6.7000	0.019	0.128	0.000	0.067
6.8000	0.019	0.129	0.000	0.067
6.9000	0.019	0.131	0.000	0.067
7.0000	0.019	0.133	0.000	0.067
7.1000	0.019	0.135	0.000	0.067
7.2000	0.019	0.137	0.000	0.067
7.3000	0.019	0.139	0.000	0.067
7.4000	0.019	0.141	0.000	0.067
7.5000	0.019	0.143	0.000	0.067
7.6000	0.019	0.145	0.000	0.067
7.7000	0.019	0.147	0.000	0.067
7.8000	0.019	0.149	0.000	0.067
7.9000	0.019	0.150	0.000	0.067
8.0000	0.019	0.152	0.000	0.067
8.1000	0.019	0.154	0.333	0.067
8.2000	0.019	0.156	0.907	0.067
8.3000	0.019	0.158	1.509	0.067
8.4000	0.019	0.160	1.960	0.067
8.5000	0.019	0.162	2.203	0.067
8.6000	0.019	0.164	2.439	0.067
8.7000	0.019	0.166	2.635	0.067
8.8000	0.019	0.168	2.817	0.067

8.9000	0.019	0.170	2.988	0.067
9.0000	0.019	0.171	3.149	0.067
9.1000	0.019	0.173	3.303	0.067
9.2000	0.000	0.000	3.450	2.070

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.91
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.237
Total Impervious Area: 0.673

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.002524
5 year	0.004166
10 year	0.005625
25 year	0.007985
50 year	0.010186
100 year	0.012827

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.013852
5 year	0.01773
10 year	0.020447
25 year	0.024058
50 year	0.026881
100 year	0.029822

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.002	0.018
1950	0.006	0.019
1951	0.006	0.012
1952	0.002	0.010
1953	0.002	0.011
1954	0.002	0.011
1955	0.002	0.013
1956	0.002	0.012
1957	0.002	0.014
1958	0.002	0.011

1959	0.002	0.012
1960	0.002	0.011
1961	0.002	0.012
1962	0.002	0.011
1963	0.002	0.012
1964	0.002	0.011
1965	0.002	0.015
1966	0.002	0.010
1967	0.002	0.017
1968	0.002	0.019
1969	0.002	0.013
1970	0.002	0.013
1971	0.002	0.015
1972	0.017	0.017
1973	0.002	0.010
1974	0.002	0.014
1975	0.002	0.016
1976	0.002	0.011
1977	0.002	0.012
1978	0.002	0.014
1979	0.002	0.020
1980	0.002	0.018
1981	0.002	0.014
1982	0.002	0.020
1983	0.002	0.016
1984	0.002	0.010
1985	0.002	0.014
1986	0.002	0.012
1987	0.002	0.019
1988	0.002	0.012
1989	0.002	0.015
1990	0.002	0.029
1991	0.005	0.021
1992	0.002	0.010
1993	0.002	0.009
1994	0.002	0.010
1995	0.002	0.013
1996	0.023	0.015
1997	0.003	0.014
1998	0.002	0.013
1999	0.005	0.027
2000	0.002	0.014
2001	0.002	0.015
2002	0.002	0.017
2003	0.002	0.014
2004	0.002	0.026
2005	0.002	0.012
2006	0.002	0.011
2007	0.034	0.027
2008	0.002	0.020
2009	0.002	0.018

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0338	0.0291
2	0.0226	0.0273
3	0.0168	0.0271

4	0.0061	0.0255
5	0.0061	0.0210
6	0.0053	0.0202
7	0.0053	0.0201
8	0.0026	0.0195
9	0.0023	0.0192
10	0.0023	0.0191
11	0.0023	0.0191
12	0.0023	0.0179
13	0.0023	0.0177
14	0.0023	0.0175
15	0.0023	0.0174
16	0.0023	0.0173
17	0.0023	0.0168
18	0.0023	0.0165
19	0.0023	0.0160
20	0.0023	0.0153
21	0.0023	0.0149
22	0.0023	0.0149
23	0.0023	0.0148
24	0.0023	0.0145
25	0.0023	0.0143
26	0.0023	0.0143
27	0.0023	0.0143
28	0.0023	0.0141
29	0.0023	0.0139
30	0.0023	0.0138
31	0.0023	0.0137
32	0.0023	0.0136
33	0.0023	0.0133
34	0.0023	0.0133
35	0.0023	0.0128
36	0.0023	0.0127
37	0.0023	0.0127
38	0.0023	0.0125
39	0.0023	0.0124
40	0.0023	0.0121
41	0.0023	0.0119
42	0.0023	0.0119
43	0.0023	0.0117
44	0.0023	0.0117
45	0.0023	0.0116
46	0.0023	0.0116
47	0.0023	0.0115
48	0.0023	0.0115
49	0.0022	0.0115
50	0.0022	0.0114
51	0.0022	0.0109
52	0.0022	0.0108
53	0.0022	0.0107
54	0.0022	0.0105
55	0.0022	0.0104
56	0.0022	0.0103
57	0.0022	0.0099
58	0.0021	0.0098
59	0.0020	0.0097
60	0.0018	0.0095
61	0.0018	0.0089

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0013	2915	66369	2276	Fail
0.0014	2485	61450	2472	Fail
0.0014	2121	57129	2693	Fail
0.0015	1798	53023	2948	Fail
0.0016	1505	49323	3277	Fail
0.0017	1296	45965	3546	Fail
0.0018	1086	42778	3939	Fail
0.0019	850	39933	4698	Fail
0.0020	625	37152	5944	Fail
0.0021	476	34650	7279	Fail
0.0022	330	32361	9806	Fail
0.0023	190	30265	15928	Fail
0.0023	41	28319	69070	Fail
0.0024	35	26458	75594	Fail
0.0025	33	24790	75121	Fail
0.0026	31	23164	74722	Fail
0.0027	30	21688	72293	Fail
0.0028	29	20371	70244	Fail
0.0029	29	19077	65782	Fail
0.0030	29	17964	61944	Fail
0.0031	28	16878	60278	Fail
0.0032	28	15847	56596	Fail
0.0032	27	14889	55144	Fail
0.0033	27	14010	51888	Fail
0.0034	27	13240	49037	Fail
0.0035	27	12525	46388	Fail
0.0036	26	11824	45476	Fail
0.0037	25	11135	44540	Fail
0.0038	25	10476	41904	Fail
0.0039	24	9894	41225	Fail
0.0040	23	9353	40665	Fail
0.0041	23	8849	38473	Fail
0.0041	23	8399	36517	Fail
0.0042	22	7946	36118	Fail
0.0043	22	7456	33890	Fail
0.0044	21	7058	33609	Fail
0.0045	21	6684	31828	Fail
0.0046	21	6314	30066	Fail
0.0047	21	5993	28538	Fail
0.0048	21	5702	27152	Fail
0.0049	20	5407	27035	Fail
0.0050	19	5129	26994	Fail
0.0050	19	4851	25531	Fail
0.0051	18	4590	25500	Fail
0.0052	18	4361	24227	Fail
0.0053	16	4147	25918	Fail
0.0054	16	3925	24531	Fail
0.0055	16	3730	23312	Fail
0.0056	16	3546	22162	Fail
0.0057	15	3392	22613	Fail
0.0058	15	3249	21660	Fail
0.0059	15	3110	20733	Fail
0.0059	15	2956	19706	Fail
0.0060	15	2815	18766	Fail

0.0061	14	2661	19007	Fail
0.0062	13	2552	19630	Fail
0.0063	13	2449	18838	Fail
0.0064	13	2342	18015	Fail
0.0065	13	2233	17176	Fail
0.0066	13	2127	16361	Fail
0.0067	12	2037	16975	Fail
0.0068	12	1935	16125	Fail
0.0069	11	1837	16700	Fail
0.0069	11	1751	15918	Fail
0.0070	11	1677	15245	Fail
0.0071	11	1601	14554	Fail
0.0072	11	1518	13800	Fail
0.0073	10	1455	14550	Fail
0.0074	10	1397	13970	Fail
0.0075	10	1330	13300	Fail
0.0076	9	1268	14088	Fail
0.0077	9	1212	13466	Fail
0.0078	9	1160	12888	Fail
0.0078	9	1110	12333	Fail
0.0079	9	1057	11744	Fail
0.0080	8	1014	12675	Fail
0.0081	8	977	12212	Fail
0.0082	8	934	11675	Fail
0.0083	8	907	11337	Fail
0.0084	8	875	10937	Fail
0.0085	8	842	10525	Fail
0.0086	8	802	10025	Fail
0.0087	8	770	9625	Fail
0.0087	8	741	9262	Fail
0.0088	8	717	8962	Fail
0.0089	8	687	8587	Fail
0.0090	8	654	8175	Fail
0.0091	8	627	7837	Fail
0.0092	8	610	7625	Fail
0.0093	8	587	7337	Fail
0.0094	8	567	7087	Fail
0.0095	8	555	6937	Fail
0.0096	8	531	6637	Fail
0.0096	8	516	6450	Fail
0.0097	8	495	6187	Fail
0.0098	8	473	5912	Fail
0.0099	8	462	5775	Fail
0.0100	8	447	5587	Fail
0.0101	8	435	5437	Fail
0.0102	8	422	5275	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

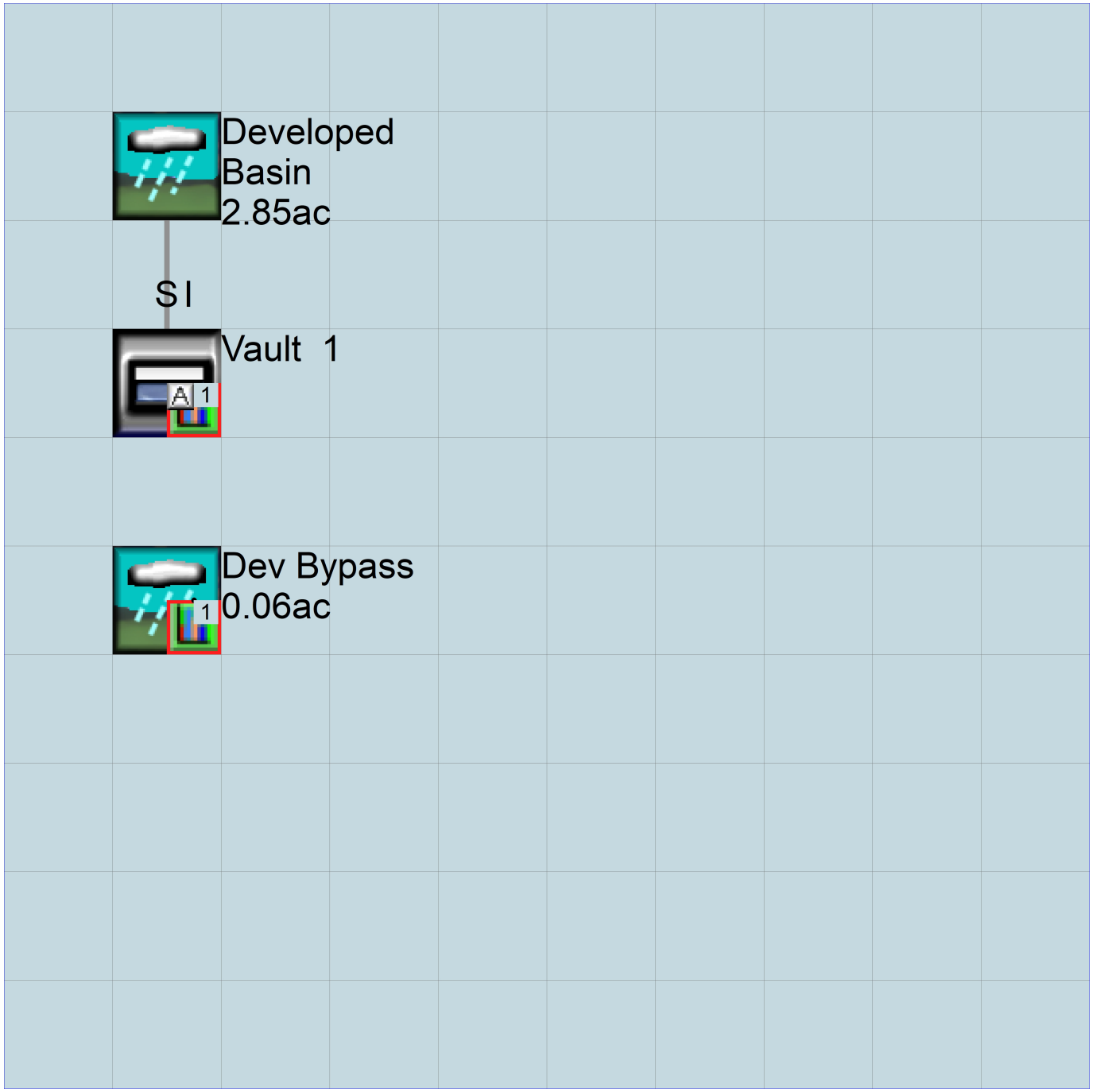
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2025-03-11 - Park Heights.wdm
MESSU       25   Pre2025-03-11 - Park Heights.MES
            27   Pre2025-03-11 - Park Heights.L61
            28   Pre2025-03-11 - Park Heights.L62
            30   POC2025-03-11 - Park Heights1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pre-Developed               MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
    2     A/B, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    2         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    2         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    2         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    2               0         5         2       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    2              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    2          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    2              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Pre-Developed***
PERLND   2                       2.854     COPY   501     12
PERLND   2                       2.854     COPY   501     13
Pre-Dev Bypass***
PERLND   2                       0.056     COPY   501     12
PERLND   2                       0.056     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
```

```
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2025-03-11 - Park Heights.wdm
MESSU       25   Mit2025-03-11 - Park Heights.MES
            27   Mit2025-03-11 - Park Heights.L61
            28   Mit2025-03-11 - Park Heights.L62
            30   POC2025-03-11 - Park Heights1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       8
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    8     A/B, Lawn, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    8         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
```

```
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    8         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    8         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    8              0         5       0.8       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    8              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                 ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    8          0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
    8              0         0         0         0         3          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                   in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1           400      0.01       0.1       0.1
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Developed Basin***
PERLND   8                       2.217     RCHRES   1      2
PERLND   8                       2.217     RCHRES   1      3
IMPLND   1                       0.637     RCHRES   1      5
Dev Bypass***
PERLND   8                        0.02     COPY   501     12
PERLND   8                        0.02     COPY   601     12
PERLND   8                        0.02     COPY   501     13
PERLND   8                        0.02     COPY   601     13
IMPLND   1                       0.036     COPY   501     15
IMPLND   1                       0.036     COPY   601     15

******Routing******
PERLND   8                       2.217     COPY     1     12
IMPLND   1                       0.637     COPY     1     15
PERLND   8                       2.217     COPY     1     13
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Vault  1                2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
```

```
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
             FG FG FG FG  possible  exit  *** possible  exit      possible  exit
              *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1         0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
    1               1      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.019100  0.000000  0.000000  0.000000
  0.100000  0.019100  0.001910  0.000000  0.067215
  0.200000  0.019100  0.003820  0.000000  0.067215
  0.300000  0.019100  0.005730  0.000000  0.067215
  0.400000  0.019100  0.007640  0.000000  0.067215
  0.500000  0.019100  0.009550  0.000000  0.067215
  0.600000  0.019100  0.011460  0.000000  0.067215
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RCHRES   1 HYDR   STAGE   1 1        1      WDM   1003 STAG     ENGL      REPL
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PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
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  END MASS-LINK   12

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PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
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RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
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Predeveloped HSPF Message File

Mitigated HSPF Message File

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Appendix B – Geotechnical Report

GEOTECHNICAL REPORT

Wu Property
89th Place Northeast and Northeast 121st Street Right-of-Way
Kirkland, Washington

Project No. T-8671

Terra Associates, Inc.

Prepared for:

BLU Development, LLC
Friday Harbor, Washington

December 29, 2023

TERRA ASSOCIATES, Inc.

Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

December 29, 2023
Project No. T-8671

Mr. Jim Jordan
BLU Development, LLC
480 Nelson Street
Friday Harbor, Washington 98250

Subject: Geotechnical Report
Wu Property
89th Place Northeast and Northeast 121st Street Right-of-Way
Kirkland, Washington

Dear Mr. Jordan:

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.

The native soils observed in the subsurface explorations consist primarily of medium dense to very dense sand to sand with silt interpreted to be advance outwash deposits. Both test borings terminated in dense to very dense glaciolacustrine silt. We observed perched groundwater seepage in three of the seven test pits and wet soils indicative of localized perched groundwater zones in both of the test borings.

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

John C. Sadler, L.E.G., L.H.G.
Senior Engineering Geologist

Theodore J. Schepper, P.E.
Senior Principal Engineer

12-29-2023

JOHN C. SADLER

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Kirkland, Washington

1.0 PROJECT DESCRIPTION

The proposed project is a four-lot residential subdivision. A preliminary site plan by Civil Engineering Solutions, dated July 27, 2023, shows the building lots accessed by a new private roadway that extends across the site to the north from the existing cul-de-sac at the northern terminus of 89th Place Northeast. Proposed roadway elevations shown on the plan indicates that the southern approximately 200 feet of the roadway will be constructed in a cut extending about 4 to 17 feet below existing grade. A retaining wall is shown supporting the upgradient side of the cut. About 65 feet of the cut wall length extends offsite into the vacated Northeast 121st Street ROW. Most of the remaining area of the roadway is a fill embankment with a maximum fill thickness of approximately ten feet. Permanent cut and fill slopes adjacent to the roadway are graded to inclinations of 2:1 (Horizontal:Vertical) or flatter. An approximately 90-foot long, 2- to 10-foot high retaining wall is shown supporting the toe of a fill slope on the downgradient side of the roadway in the central portion of the site.

Stormwater runoff from the site will be managed by on-site infiltration. Runoff from most of the private roadway and paved areas of the building lots will be directed to an approximately 95-foot long, 18-foot wide infiltration vault located beneath a section of the roadway in the southwestern portion of the site. Stormwater runoff from roof downspouts will be conveyed to several drywells located on the downgradient side of the roadway in the northeastern portion of the site.

Proposed building locations and building plans are currently not available. We expect that the residences will be two to three-story wood frame structures, with the main floor levels constructed at grade or framed over a crawl space or daylight basement. We anticipate that foundation loads would be relatively light, in the range of 2 to 3 kips per foot for bearing walls and 25 to 50 kips for isolated columns.

The recommendations contained in the following sections of this report are based on these design features. We should review design drawings and specifications as they are developed to verify that our recommendations are valid for the proposed construction and to amend or modify our report, as necessary.

2.0 SCOPE OF WORK

We explored subsurface conditions at the site in seven test pits excavated to depths of about 8 to 10.5 feet using a track-mounted excavator, and in two test borings drilled to depths of 31.5 feet and 71 feet with a track-mounted drill rig using hollow-stem auger drilling methods. Using the results of our subsurface exploration and laboratory testing, analyses were undertaken to develop geotechnical recommendations for project design and construction.

Specifically, this report addresses the following:

- Soil and groundwater conditions.
- Geologic hazards per the Kirkland Zoning Code (KZC).
- Seismic site class per the current International Building Code (IBC).
- Site preparation and grading.
- Excavations.
- Foundations.
- Slab-on-grade floors.
- Lateral earth pressures for retaining wall design.
- Stormwater infiltration feasibility.
- Drainage.
- Utilities.
- Pavements.

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

3.0 SITE CONDITIONS

3.1 Surface

The site is a 3.98-acre assemblage of four undeveloped parcels located north of the cul-de-sac at the northern terminus of 89th Place Northeast and the undeveloped right-of-way (ROW) for Northeast 121st Street in Kirkland, Washington. The site location is shown on Figure 1.

The site is situated on a southeast-facing hillside on the southeastern side of Finn Hill. Elevation contours on the preliminary site pan shows the topographic relief across the site is about 112 feet between the northwestern site corner and the bottom of a drainage ravine near the southeastern site corner.

Site topography is characterized by two southeast-oriented ravines separated by a broad, southeast-plunging ridge. Elevation contours on the preliminary site plan shows the ravine slopes are typically about 30 to 40 feet in height with maximum slope inclinations of about 40 to 60 percent. Surface gradients along the axes of the ravines and ridgetops range between about 9 and 13 percent and about 20 and 30 percent, respectively.

The site slopes appear relatively stable. We did not observe indications of deep-seated instability, groundwater seepage, persistently-wet surface conditions, or significant active erosion on the slopes. The slope areas typically support the growth of very large, relatively straight, mature coniferous trees, which are an indication of long-term, stable slope conditions.

We did not observe developed channels or indications of surface water flow along the ravine axes. The only site area where we observed surface water and/or indications of persistently wet surface conditions was along the axis of the southern-most onsite drainage ravine, approximately 100 feet inside the eastern site margin.

3.2 Soils

The soils observed in our subsurface explorations are glacial deposits consisting predominantly of medium dense to very dense, fine- to medium-grained sand with variable minor proportions of silt and gravel. Medium dense to dense sand with varying amounts of silt and gravel was encountered the full depth of Test Pits TP-1 through TP-4, and below approximately 1.5 to 4 feet of medium dense, silty sand with scattered gravel in Test Pits TP-101, TP-102, and PIT-1, which were all excavated near the axis of the southern drainage ravine.

Borings B-4 and B-5 both encountered dense to very dense, glaciolacustrine silt below depths of about 70 feet and 25 feet, respectively. These depths correlate to elevations of 302 feet and 299 feet and indicate that the top of the silt deposit is relatively flat.

The *Geologic Map of the Kirkland Quadrangle, Washington*, by James P. Minard, dated 1983, shows the site soils mapped as Vashon till (Qvt). We did not observe till at the site. The sand deposits observed in our subsurface explorations are interpreted to be Vashon advance outwash (Qva). The dense to very dense silt encountered in Borings B-4 and B-5 is interpreted to be a glaciolacustrine deposit consistent with the transitional bed geologic map unit (Qtb), which stratigraphically underlies the Qva. Both Qva and Qtb soils are mapped downgradient and east of the site.

Detailed descriptions of the conditions we observed in our subsurface explorations are presented on the Test Pit and Test Boring Logs in Appendix A. The approximate test pit and test boring locations are shown on Figure 2.

3.3 Groundwater

We observed groundwater seepage in three of the seven test pits and wet soils indicative of localized perched groundwater zones in both of the test borings. The groundwater observed in Test Pits TP-3 and TP-4 consisted of very light to light seepage below depths of approximately 7.5 to 8.5 feet. We observed moderate to heavy groundwater seepage below a depth of approximately 9 feet in Test Pit TP-101, which was excavated along the axis of the southern drainage ravine, about 70 feet west-northwest and upgradient from a delineated wetland area identified as Wetland A on the preliminary site plan. The groundwater in Test Borings B-4 and B-5 is perched above the low-permeability glaciolacustrine silt at depths of approximately 65 feet and 20 feet, respectively.

Based on the topography shown on the preliminary site plan, the groundwater levels observed in Test Pits TP-3, TP-101, and Test Borings B-4 and B-5, correlate with elevations of about 300 feet, 313 feet, 307 feet, and 304 feet, respectively. These elevations indicate a southeasterly direction of groundwater flow at gradients between approximately three and six percent.

3.4 Geologic Hazards

We evaluated site conditions for the presence of geologic hazards. Chapter 5.10.328 of the Kirkland Zoning Code (KZC) defines geologically hazardous areas as landslide hazard areas, erosion hazard areas, and seismic hazard areas.

3.4.1 Erosion Hazard Areas

Chapter 5.10.292 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 soils underlying the site as *Alderwood gravelly sandy loam, 15 to 30 percent slopes* (AgD). The NRCS describes Alderwood soils as formed over till, which is not consistent with the outwash soils observed in our subsurface explorations. In our opinion, the site soils would be better classified as *Indianola loamy sand, 5 to 15 percent slopes (InC)* or *Indianola loamy sand, 15 to 30 percent slopes (InD)*, which are described by the NRCS as formed over sandy outwash. The NRCS describes InC and InD soils as having a moderate and severe erosion hazard, respectively. Based on our interpretation of the site soil types and the above criteria, site areas having an inclination of 15 percent or steeper are considered erosion hazard areas. Available topographic information indicates that this would include most of the subject site.

As discussed, we did not observe any indications of significant active erosion at the site. Regardless, the site soils will be susceptible to erosion when exposed during construction. In our opinion, proper installation and maintenance of Best Management Practices (BMPs) for erosion prevention and sedimentation control would adequately mitigate the erosion potential in the planned development area. All BMPs for erosion prevention and sedimentation control should conform to City of Kirkland requirements.

3.4.2 Landslide Hazard Areas

Chapter 5.10.467 of the KZC defines landslide hazard areas as "Areas at risk of mass movement due to a combination of geologic, topographic, and hydrologic factors. Includes high and moderate landslide hazard areas."

High Landslide Hazard Areas

Chapter 5.10.361.5 of the KZC defines high landslide hazard areas (HLHAs) as:

1. Areas that have shown movement during the Holocene epoch (from 10,000 years ago to the present) or that are underlain or covered by mass wastage debris of that epoch; or

2. Areas with both of the following characteristics:
   a. Slopes steeper than 15 percent that intersect geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment; and
   b. Springs; or

3. Areas potentially unstable because of rapid stream incision, stream bank erosion, or undercutting by wave action; or

4. Any area with a slope of 40 percent or steeper over a height of at least 10 feet.

5. For areas meeting the criteria of subsections (1) through (4) of this definition, the high landslide hazard area also includes the area within a horizontal distance "H" equal to either the height of the slope or 50 feet, whichever is greater.

We did not observe site conditions meeting the criteria defining HLHAs in above items 1 through 3. As discussed, onsite slope areas exist with maximum heights and inclinations ranging between approximately 30 and 40 feet and 40 to 60 percent, respectively, which meets the geometric criteria defining a HLHA in above item 4. As required by above item 5, onsite delineation of the HLHA includes areas of the site extending 50 feet beyond the slope areas meeting the geometric criteria given in above item 4. The approximate areas of the onsite HLHAs delineated by these criteria are shown on Figure 3.

As discussed, we did not observe any indications of deep-seated instability, groundwater seepage, persistently wet surface conditions, or indications of significant active erosion on or above the site slopes. Based on our field observations and the conditions observed in our subsurface explorations, it is our opinion that the site slopes are stable with respect to deep-seated ground movement. Our opinion of deep-seated slope stability is supported by the results of our LiDAR review, map review, and stability analyses discussed below.

LiDAR Review

We reviewed LiDAR digital terrain (bare earth) modeling of the site and adjacent property using the Washington State Department of Natural Resources Lidar Portal website (https://lidarportal.dnr.wa.gov/). The LiDAR model shows onsite slope areas and slope areas immediately adjacent to the site with relatively smooth, uniform surfaces and no topographic characteristics indicative of deep-seated land sliding. This is consistent with our field observations.

Map Review

The City of Kirkland GIS map viewer website (https://maps.kirklandwa.gov/Html5Viewer/) shows most of the ravine side slopes in the planned development area mapped as high susceptibility landslide hazard areas (HLHAs) with the vast majority of remaining site areas mapped as moderate susceptibility landslide hazard areas (MLHAs). No landslide features are mapped on the subject property. The closest mapped landslide features are three individual head scarps and associated landslide deposit areas on the east-facing slope about 150 to 215 feet east of the eastern site margin. The HLHAs, MLHAs, and mapped landslide features are shown on Figure 3.

Review of post-2017 landslide inventory mapping using the Washington State Department of Natural Resources (DNR) Geologic Information Portal interactive website (https://www.dnr.wa.gov/geologyportal) shows one landslide mapped about 150 feet east of the southeastern site corner. The DNR-mapped landslide is in approximately the same location as the southernmost slide feature shown on Figure 3.

Stability Analysis

We performed a two-dimensional limit equilibrium stability analysis of steep onsite slope areas in the planned development area using the computer program Slide2 v.9.009, published by RocScience, Inc. Our analyses were performed for both static and pseudostatic (seismic) loading of existing and proposed conditions on slope sections identified on Figures 2 and 3 as Section A-A' and Section B-B'. Soil parameters used for our analyses are estimates based on field data obtained from our subsurface explorations, our experience with similar soil and slope conditions, and published data. The soil parameters are shown on the attached Slide2 analysis report and graphical output plots in Appendix B. Generalized geologic profiles along Sections A-A' and B-B' are shown on Figures 4 and 5.

The pseudostatic analysis used a horizontal earthquake coefficient value of 0.322g to model ground motions expected from a severe earthquake. This seismic acceleration value is one-half of the site-modified peak ground acceleration (PGA_M) value for the ASCE 7-16 maximum considered earthquake (MCE) determined for the site (Latitude 47.70948182 and Longitude -122.22226262) using the Structural Engineers Association of California (SEAOC) U.S. Seismic Design Maps website (https://seismicmaps.org/) accessed on December 11, 2023.

The lowest factors of safety determined by our analyses are shown below:

Table 1 – Slope Stability Safety Factors

Slope Section Analyzed	Minimum Safety Factors		
	Static	**Pseudostatic**	**Static – No Cohesion**
A-A' Existing	1.91	1.05	1.73
A-A' Proposed	2.39	1.16	2.13
B-B' Existing	2.50	1.27	2.34
B-B' Proposed	2.77	1.34	2.63
Min. Acceptable Safety Factors [1,2]	*1.5*	*1.1*	*1.5*

1 Minimum safety factor values considered acceptable for stable slopes by local geotechnical engineering practice.

2 Minimum safety factor values per KZC 85.25.7

The results of the stability analyses indicate the existing and proposed slope conditions are stable under static and pseudostatic loading. With the exception of the pseudostatic loading of the existing slope condition along Section A-A', all safety factors determined by the analyses are greater than the minimum safety factor values considered acceptable for stable slopes by local geotechnical engineering practice and the KZC (1.5 static and 1.1 pseudostatic.)

Potential Impacts and Mitigation

As shown on Figure 3, the vast majority of the planned development will impact areas classified as HLHAs. The stability analysis results shows the proposed roadway construction on Sections A-A' and B-B' has a positive effect on slope stability, with increased safety factors for the static and pseudostatic loading conditions, and the static loading condition with no cohesive soil strength included in the slope model. Provided the geotechnical recommendations provided herein are followed, it is our opinion that the proposed roadway construction will have no adverse impact on the stability of the HLHAs. It is also our opinion that the onsite HLHAs present no potential hazard to the proposed roadway.

Potential impacts to the HLHAs would be an increase in the erosion potential by exposing soils during construction. In our opinion, potential erosion and sedimentation impacts to the HLHAs would be adequately mitigated by applying Best Management Practices (BMPs) for temporary erosion prevention and sedimentation control. The temporary erosion prevention and sedimentation control BMPs should be in place when construction is initiated and maintained until permanent stabilizing measures are established.

Moderate Landslide Hazard Areas

Chapter 5.10.536.7 of the KZC defines moderate landslide hazard areas (MLHAs) as "Areas with slopes between 15 percent and 40 percent which do not meet the definition of high landslide hazard area." Based on City of Kirkland mapping, the vast majority of the site area not meeting the defining criteria of a HLHA meet the above criteria defining a MLHA. The approximate location of on-site MLHAs are shown on Figure 3.

Because of the gentle to moderate slope inclinations and considering that the native soils underlying the MLHAs consist predominantly of well drained, medium dense to dense outwash sand to sand with silt that has an internal friction angle greater than the steepest natural slope inclination, it is our opinion that the on-site MLHAs are not susceptible to land sliding, and no potential landslide hazard exists. Provided the geotechnical recommendations presented herein are followed, it is our opinion that the planned site development would have no adverse impact on site stability with regard to the MLHAs. In our opinion, proper application and maintenance of erosion and sedimentation BMPs would adequately mitigate potential erosion hazards to the MLHAs.

3.4.3 Seismic Hazard Areas

Chapter 5.10.827 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."

In our opinion, seismic hazard areas as defined by the KZC do not exist at the site. Based on conditions observed in our subsurface explorations, it is our opinion that there is little to no risk for severe damage resulting from seismically-induced soil liquefaction or settlement to occur at the site, and that design in accordance with local building codes for determining seismic forces would adequately mitigate impacts associated with ground shaking. As discussed, the results of the slope stability analyses indicate that the site slopes are stable under seismic loading.

3.5 Seismic Site Class

Based on the site soil conditions and our knowledge of the area geology, per the current 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 the planned development. The residences can be supported on conventional spread footings bearing on competent native soils underlying organic topsoil, or on structural fill placed on a competent native soil subgrade. Floor slabs and pavements can be similarly supported.

Most of the near-surface soils observed at the site contain a sufficient amount of fines (silt and clay sized particles) such that they will be difficult to compact as structural fill when too wet or too dry. Accordingly, the ability to use the soils from site excavations as structural fill will depend on their moisture content and the prevailing weather conditions at the time of construction, and the ability of the contractor to properly moisture condition the soil. If grading activities take place during the winter season, the owner 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. Terra Associates, Inc. should review development and building plans for the project when available to verify that our geotechnical recommendations have been properly interpreted and incorporated into the project design, and to provide additional or alternate recommendations, if needed.

4.2 Site Preparation and Grading

To prepare the site for construction, all vegetation, organic surface soils, and other deleterious materials should be stripped and removed from the site. We expect surface stripping depths of about six to ten inches will generally be required to remove the organic surficial soils in the planned development areas. Stripped vegetation debris should be removed from 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.

Once clearing and stripping operations are complete, cut and fill operations can be initiated to establish desired grades. A representative of Terra Associates, Inc. should examine all bearing surfaces to verify that conditions encountered are as anticipated and are suitable for placement of structural fill or direct support of building and pavement elements. Our representative may request proofrolling exposed surfaces with a heavy rubber-tired vehicle to determine if any isolated soft and yielding areas are present. If unstable yielding areas are observed, they should be cut to firm bearing soil and filled to grade with structural fill. If the depth of excavation to remove unstable soils is excessive, use of geotextile fabric such as Mirafi 500X or equivalent in conjunction with structural fill can be considered in order to limit the depth of removal. In general, our experience has shown that a minimum of 18 inches of clean, granular structural fill over the geotextile fabric should establish a stable bearing surface.

We anticipate that most of the site soils will be suitable for use as structural fill provided they are properly moisture conditioned when placed. As discussed, the ability to use the native soils will depend on the soil's moisture content when excavated, the prevailing weather conditions during site grading, and the ability of the contractor to properly moisture condition the soil.

During the normally dry summer months, it may be possible to dry soils that are wet of optimum by aeration. As an alternative, stabilizing the moisture in the native soil with cement or lime can be considered. If soil amendment products are used, additional Temporary Erosion and Sedimentation Control (TESC) BMPs will need to be implemented to mitigate potential impacts to stormwater runoff associated with possible elevated pH levels. Moisture conditioning of soils that are dry of optimum would require the addition of water to the soils and thoroughly blending the material prior to compaction.

If grading activities are planned during the wet winter months, or if they 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 planned to be imported to the site for use as structural fill.

Structural fill should consist of properly moisture conditioned material that is 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-698 (Standard 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.

4.3 Slopes and Embankments

All permanent cut and fill slopes should be graded with a finished inclination of no greater than 2:1 (Horizontal:Vertical). 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 site slopes 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 top of a slope, it may be necessary to route collected water to an appropriate point of discharge beyond the toe in a closed system.

Embankment fills placed on slopes exceeding a grade of 20 percent must be keyed and benched into competent native soils. A generalized slope fill detail is shown on Figure 6. At a minimum, we recommend constructing a toe drain in the key trench for the fill embankment. The locations and extent of such toe drains will be best determined in the field at the time of construction. All fill placed for embankment construction should meet the structural fill requirements provided in Section 4.2 of this report.

4.4 Excavations

All excavations at the site associated with confined spaces, such as lower building level retaining walls, must be completed in accordance with local, state, and federal requirements. Based on the Washington State Safety and Health Administration (WSHA) regulations, the medium dense to very dense outwash sand would be classified as a Type C soil. The dense to very dense glaciolacustrine silt would be classified as a Type B soil.

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 an inclination of 1.5:1 (Horizontal:Vertical) or flatter. Temporary slopes in Type B soils can be sloped at an inclination of 1:1 or flatter. If there is insufficient room to complete the excavations in this manner, or if excavations greater than 20 feet deep are planned, you may need to use temporary shoring to support the excavations.

Based on conditions observed in our subsurface explorations, we do not expect that site excavations would encounter significant groundwater even during the normally-wet winter and spring months. If encountered, we expect that the volume of water and rate of flow into site excavations would be relatively minor, and would not be expected to impact the stability of the excavations when completed as described above.

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.

4.5 Foundations

The buildings may be supported on conventional spread footing foundations bearing on subgrades prepared as recommended in Section 4.2 of this report. Perimeter foundations exposed to the weather should bear at a minimum depth of one and one-half feet below final exterior grades for frost protection. Interior foundations can be constructed at any convenient depth in crawl spaces and below the floor slabs.

We recommend designing foundations 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 this allowable capacity can be used in design. A base friction coefficient of 0.35 can be used for designing foundations to resist lateral loads. Passive earth pressures acting on the sides of the footings can 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 it can be affected by weather or disturbed by future grading activity. This value assumes the foundations will be backfilled with structural fill, as described in Section 4.2 of this report. The recommended values include a safety factor of 1.5.

4.6 Slab-on-Grade Floors

Slabs on grade may be supported on subgrades prepared as recommended in Section 4.2 of this report. Immediately below the floor slabs, we recommend placing a 4-inch thick capillary break layer of clean, free-draining, 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 slabs.

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 and 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 that if the sand or gravel layer overlying the membrane is saturated prior to pouring the slab, it will be ineffective in assisting in uniform curing of the slab and can actually serve as a water supply for moisture transmission through the slab and affecting 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. We recommend floor designers and contractors refer to the latest American Concrete Institute (ACI) Manual of Concrete Practice for further information regarding vapor barrier installation below slab-on-grade floors.

4.7 Lateral Earth Pressures for Below-Grade Walls

The magnitude of earth pressures developing on below-grade walls will depend upon the quality and compaction of the wall backfill. We recommend placing and compacting wall backfill as structural fill, as described in Section 4.2 of this report. To prevent overstressing the walls during backfilling, heavy construction machinery should not be operated within five feet of the wall. Wall backfill in this zone should be compacted with hand-operated equipment. To prevent hydrostatic pressure development, wall drainage must also be installed. A typical wall drainage detail is shown on Figure 7.

With wall backfill placed and compacted as recommended, and drainage properly installed, we recommend designing unrestrained walls for an active earth pressure equivalent to a fluid weighing 35 pcf. For restrained walls, an additional uniform load of 100 psf should be added to the 35 pcf. To account for typical traffic surcharge loading, the walls can be designed for an additional imaginary height of two feet (two-foot soil surcharge). 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 assume a horizontal backfill condition and that no other surcharge loading, sloping embankments, or adjacent buildings will act on the wall. If such conditions exist, then the imposed loading must be included in the wall design. Friction at the base of foundations and passive earth pressure will provide resistance to these lateral loads. Values for these parameters are provided in Section 4.5 of this report.

Roadway Retaining Walls

As discussed, retaining walls will be required to support vertical grade transitions in cuts and fills for construction of the proposed private roadway. Due to the proximity of the proposed cut wall to the south property boundary, the sloping topography, and a maximum wall height of about 17 feet, we recommend that the cut wall consist of a cantilevered or tieback-anchored soldier pile wall system.

Gravity block or mechanically stabilized earth (MSE) walls can be used for support of the roadway fill embankment. We can provide retaining wall design and construction details once final grading plans are available.

4.8 Infiltration Feasibility

Based on our study, it is our opinion that the outwash sand and sand with silt deposits observed below depths of about two to four feet in our subsurface explorations are a suitable receptor for stormwater infiltration. The results of grain size analyses of soil samples collected from test pits excavated in the proposed stormwater infiltration vault location indicate the soils are classified as *sand* using USDA textural analysis.

We performed a small-scale pilot infiltration test (PIT) in the location of the proposed roadway infiltration facility shown on the preliminary site plan. The test location is identified as PIT-1 on Figure 2. The Test Pit Log associated with the PIT (PIT-1) is presented in Appendix A.

The PIT was conducted in general conformance with the procedures outlined in Chapter 5, Section 5.2 of the 2021 King County Surface Water Design Manual and City of Kirkland Policy D-10 Addendum to the 2021 KCSWDM. The test was performed in medium dense, advance outwash sand approximately 4.5 feet below ground surface (approximately Elev. 322.5). The test location is identified as PIT-1 on Figure 2. The PIT data is presented in Appendix C. The test results are summarized below in Table 2:

Table 2 – Pilot Infiltration Test Results

Test ID	Approx. Test Depth (ft bgs)	Approx. Test Elev. (ft)	Steady Flow Rate (gpm)	Measured Infiltration Rate ($I_{measured}$) (in/hr)	Total Correction Factor[1] (F_{total})	Estimated Design Infiltration Rate ($I_{Design} = I_{measured} \times F_{total}$) (in/hr)
PIT-1	4.5	Elev. 322.5	3.0	18.05	0.19	3.49

ft bgs feet below ground surface
gpm gallons per minute
in/hr inches per hour
1 $F_{total} = F_{testing} \times F_{geometry} \times F_{plugging}$ (2021 KCSWDM Section 5.2.1)

The correction factor for facility geometry incorporated in the above total correction factor is based on the approximately 100-foot width of the vault as shown on the preliminary site plan and a minimum vertical separation distance of 9.5 feet between the base of the facility and the seasonal high groundwater level beneath the vault. Because we did not observe groundwater in PIT-1 or Test Pit TP-102, which were located at the downgradient edge of the vault, we assumed a seasonal groundwater level at Elev. 313, which coincides with the depth to groundwater observed in Test Pit TP-101, which was located at a slightly lower elevation about 35 to 40 feet east of PIT-1.

We should review final storm drainage plans to assess the suitability of the design infiltration rate for the facility and to evaluate potential impacts to steep slope landslide hazard critical areas located off site approximately 150 feet to the east. Additional infiltration field testing may be required as plans are finalized. Location-specific field testing will also be required at individual-lot rooftop infiltration drywells.

4.9 Drainage

Surface

Final exterior grades should promote free and positive drainage away from the building areas. If a positive gradient cannot be provided, provisions for collection and disposal of surface water adjacent to the structure should be provided.

Surface water from developed areas must not be allowed to flow in an uncontrolled and concentrated manner over the crests of site slopes or embankments. Surface water should be directed away from slope crests to a point of collection and controlled discharge. If site grades do not allow for directing surface water away from the slopes, then the water should be collected and tightlined to an approved point of controlled discharge.

Subsurface

We recommend installing a continuous drain along the outside lower edge of the perimeter building foundations. The drains can consist of four-inch diameter perforated PVC pipe that is enveloped in washed one-half- to three-quarters-inch gravel-sized drainage aggregate that extends six inches above and to the sides of the pipe. The pipe can be laid to grade at an invert elevation equivalent to the bottom of footing grade.

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 local jurisdictional requirements. At minimum, trench backfill should be placed and compacted as structural fill as described in Section 4.2 of this report. As noted, the near-surface native soils are moisture sensitive and will require careful control of moisture to facilitate proper compaction. If utility construction takes place during the winter or if it is not feasible to properly moisture condition the excavated soil at the time of construction, it may be necessary to import suitable wet weather fill for utility trench backfilling.

4.11 Pavements

Pavements should be constructed a subgrade that is prepared as recommended in Section 4.2 of this report. Regardless of the degree of relative compaction achieved, the subgrade must be firm and relatively unyielding before paving. Proofrolling the subgrade with heavy construction equipment should be completed to verify this condition.

The pavement design section is dependent upon the supporting capability of the subgrade soils and the traffic conditions to which it will be subjected. For traffic consisting mainly of light passenger vehicles with only occasional heavy traffic, and with a stable subgrade prepared as recommended, we recommend the following pavement sections:

- Two inches of hot mix asphalt (HMA) over four inches of crushed rock base (CRB).
- Three and one-half inches full depth HMA over prepared subgrade.

The paving materials used should conform to the Washington State Department of Transportation (WSDOT) specifications for half-inch class HMA and CRB.

Long-term pavement performance will depend on surface drainage. A poorly drained pavement section will be subject to premature failure as a result of surface water infiltrating into the subgrade soils and reducing their supporting capability. For optimum pavement performance, we recommend surface drainage gradients of at least two percent. Some degree of longitudinal and transverse cracking of the pavement surface should be expected over time. Regular maintenance should be planned to seal cracks when they occur.

5.0 ADDITIONAL SERVICES

Terra Associates, Inc. should review the final designs and specifications in order to verify that 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. No other warranty, expressed or implied, is made. This report is the copyrighted property of Terra Associates, Inc. and is intended for specific application to the Wu Property project in Kirkland, Washington. This report is for the exclusive use of BLU Development, 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 the subsurface explorations completed at the site. 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: WSDOT GEOPORTAL

NOT TO SCALE

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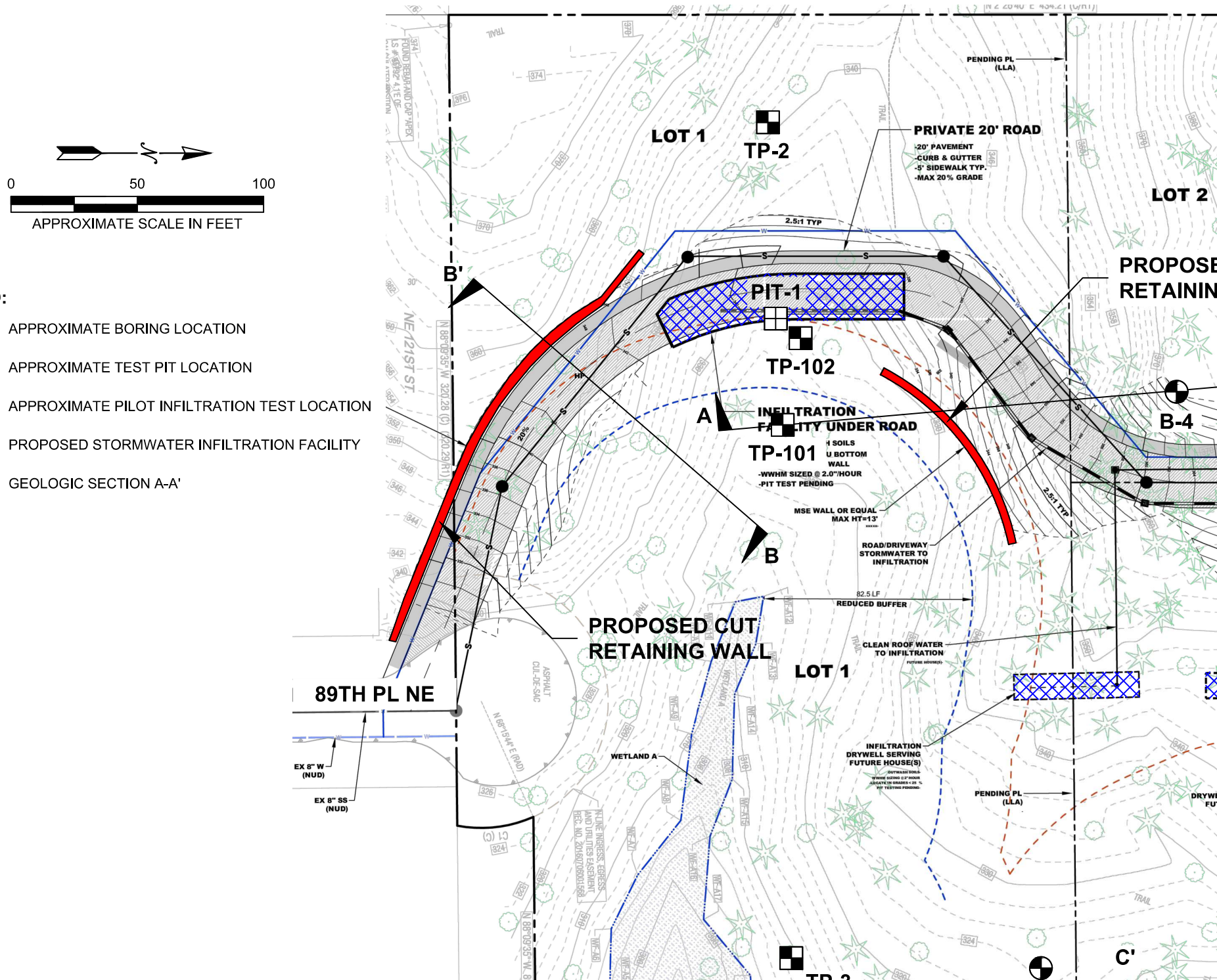
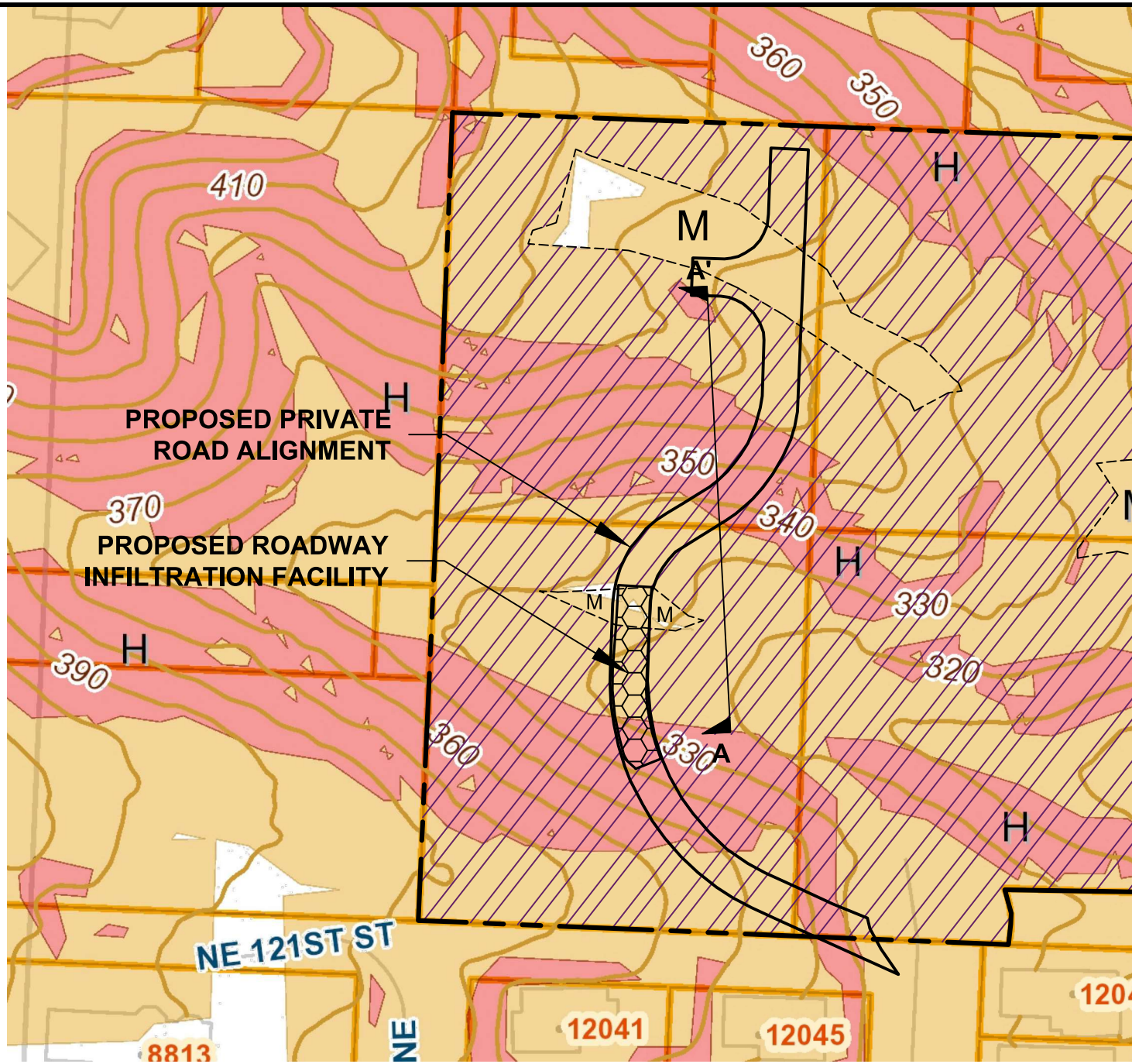
Geology and
Environmental Earth Sciences

VICINITY MAP
WU PROPERTY
KIRKLAND, WASHINGTON

Proj. No.T-8671	Date DEC 2023	Figure 1


0
50
100
APPROXIMATE SCALE IN FEET
LEGEND:
APPROXIMATE BORING LOCATION
APPROXIMATE TEST PIT LOCATION
APPROXIMATE PILOT INFILTRATION TEST LOCATION
PROPOSED STORMWATER INFILTRATION FACILITY
A A' GEOLOGIC SECTION A-A'
LOT 1
TP-2
PRIVATE 20' ROAD
-20' PAVEMENT
-CURB & GUTTER
-5' SIDEWALK TYP.
-MAX 20% GRADE
PENDING PL (LLA)
LOT 2
2.5:1 TYP
B'
PIT-1
TP-102
A
INFILTRATION FACILITY UNDER ROAD
TP-101
-WWHM SIZED @ 2.0"/HOUR
-PIT TEST PENDING
B-4
MSE WALL OR EQUAL MAX HT=13'
ROAD/DRIVEWAY STORMWATER TO INFILTRATION
B
82.5 LF REDUCED BUFFER
PROPOSED CUT RETAINING WALL
LOT 1
CLEAN ROOF WATER TO INFILTRATION
89TH PL NE
EX 8" W (NUD)
EX 8" SS (NUD)
WETLAND A
INFILTRATION DRYWELL SERVING FUTURE HOUSE(S)
PENDING PL (LLA)
C'
NE 121ST ST.



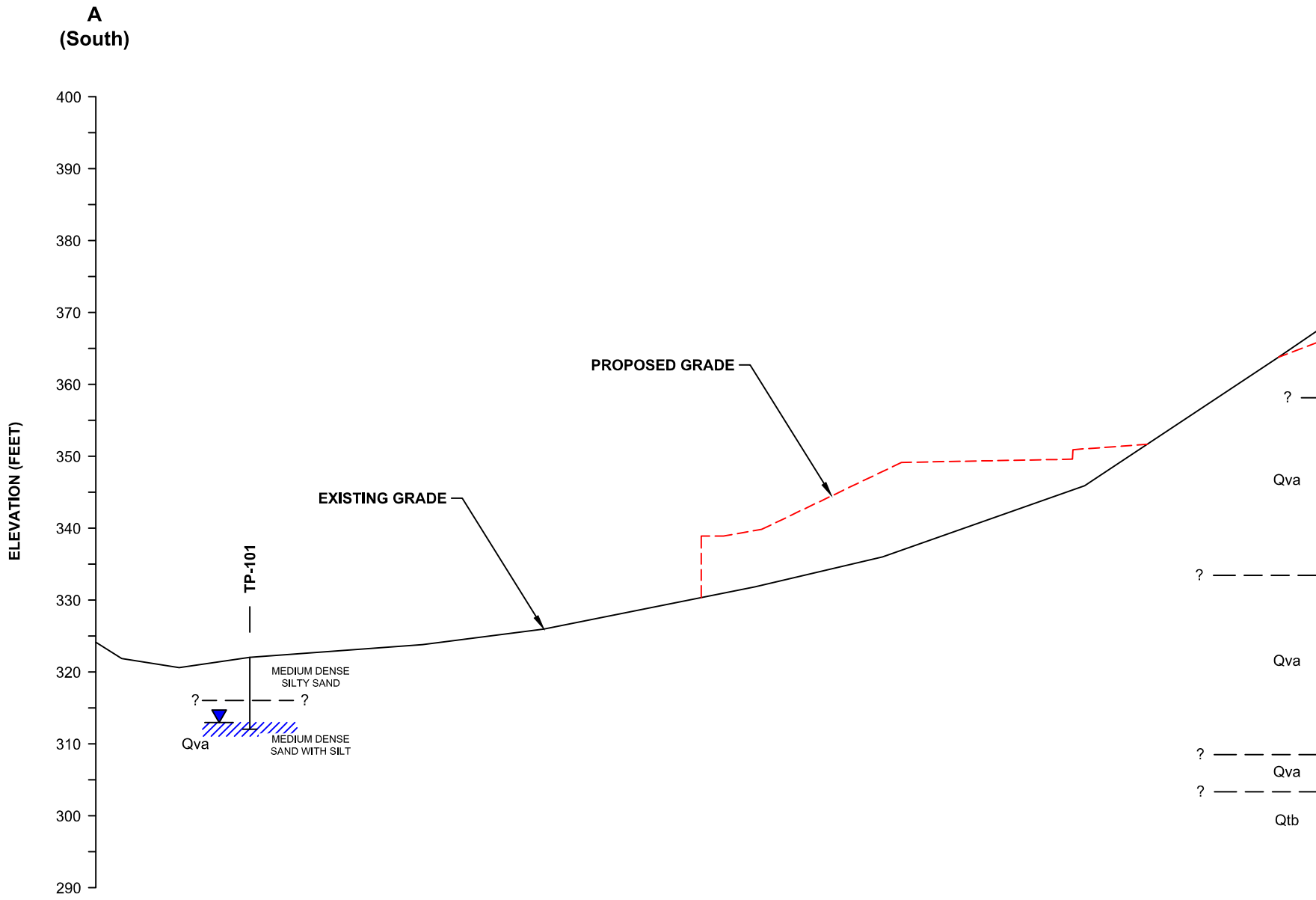
N

0 80 160

APPROXIMATE SCALE IN FEET

LEGEND:

HIGH SUSCEPTIBILITY LANDSLIDE HAZARD AREA PER KIRKLAND MAPS AND KZC CHAPTER 5.10.361.5.5

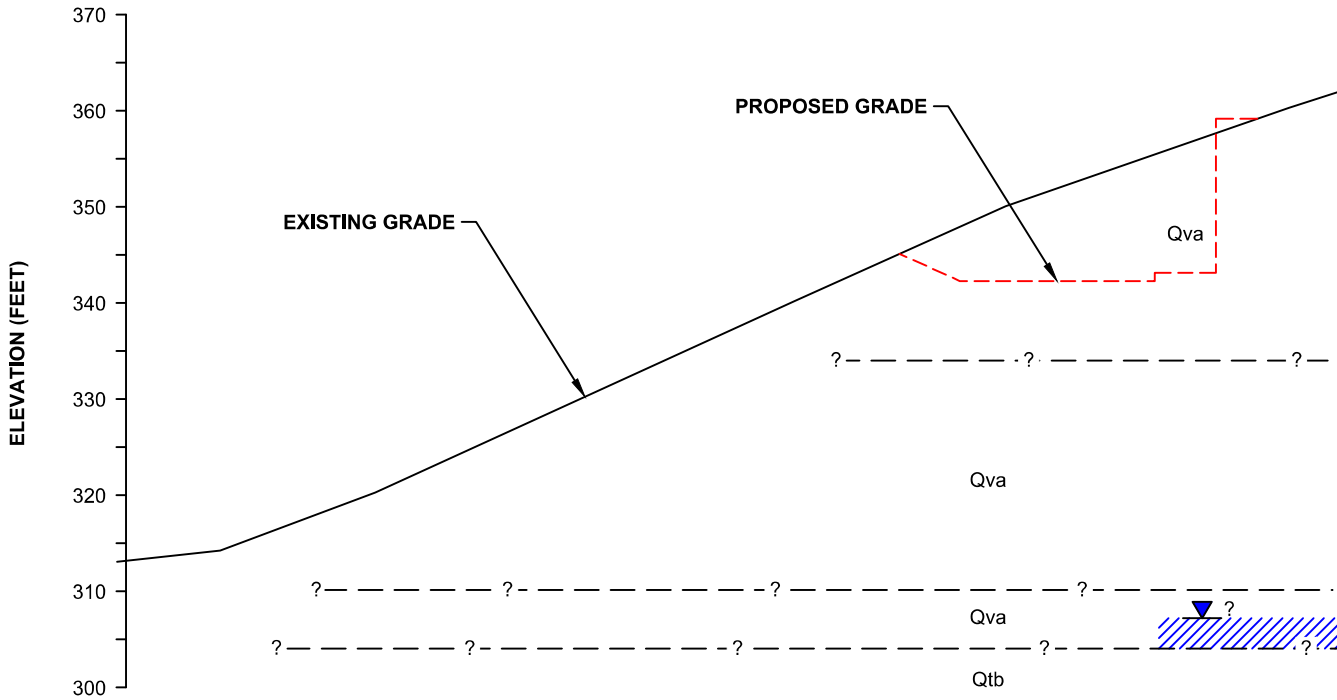


LEGEND:

Qva VASHON ADVANCE OUTWASH

0 20 40

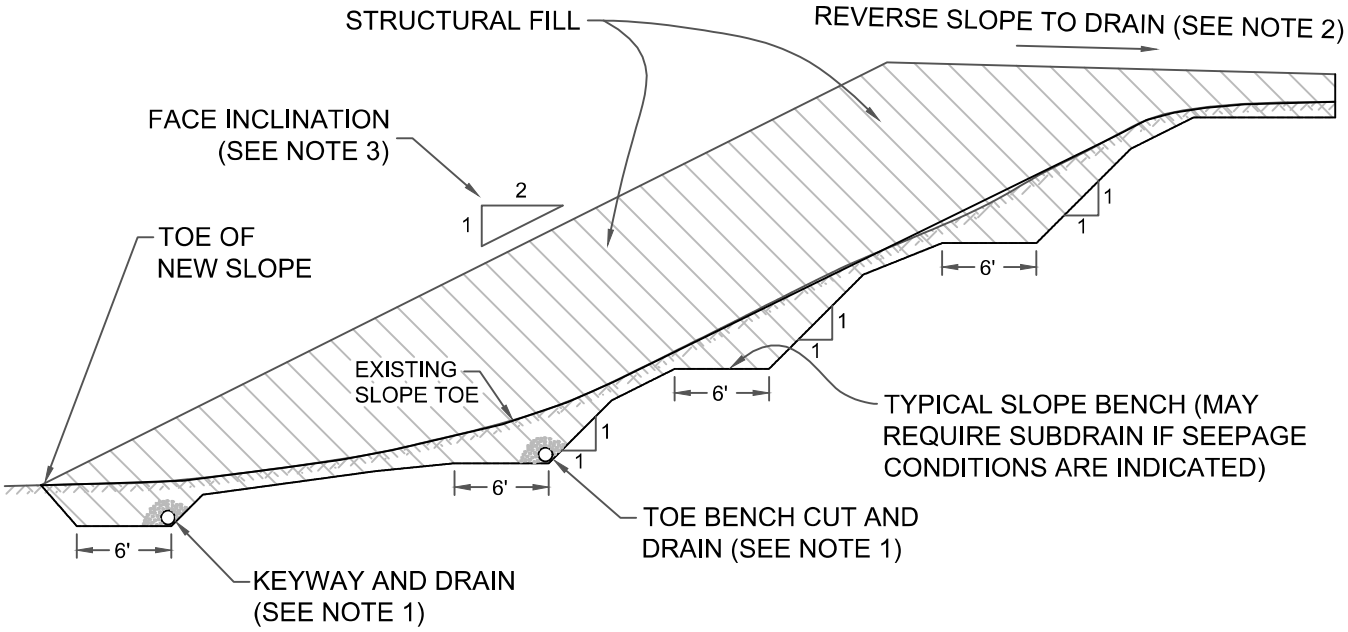
B
(North)



LEGEND:

Qva VASHON ADVANCE OUTWASH

0 20 40



NOT TO SCALE

NOTES:

1) DRAINS SHALL CONSIST OF 6" DIAMETER PERFORATED PVC PIPE ENVELOPED IN 1 cu. ft. OF WASHED 3/4" MINUS DRAINAGE GRAVEL.
2) RECOMMENDED PRIOR TO ESTABLISHMENT OF PERMANENT EROSION CONTROL MEASURES AND SITE DRAINAGE.
3) PERMANENT FACE INCLINATION TO BE ESTABLISHED AT 2:1 (H:V) OR AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER

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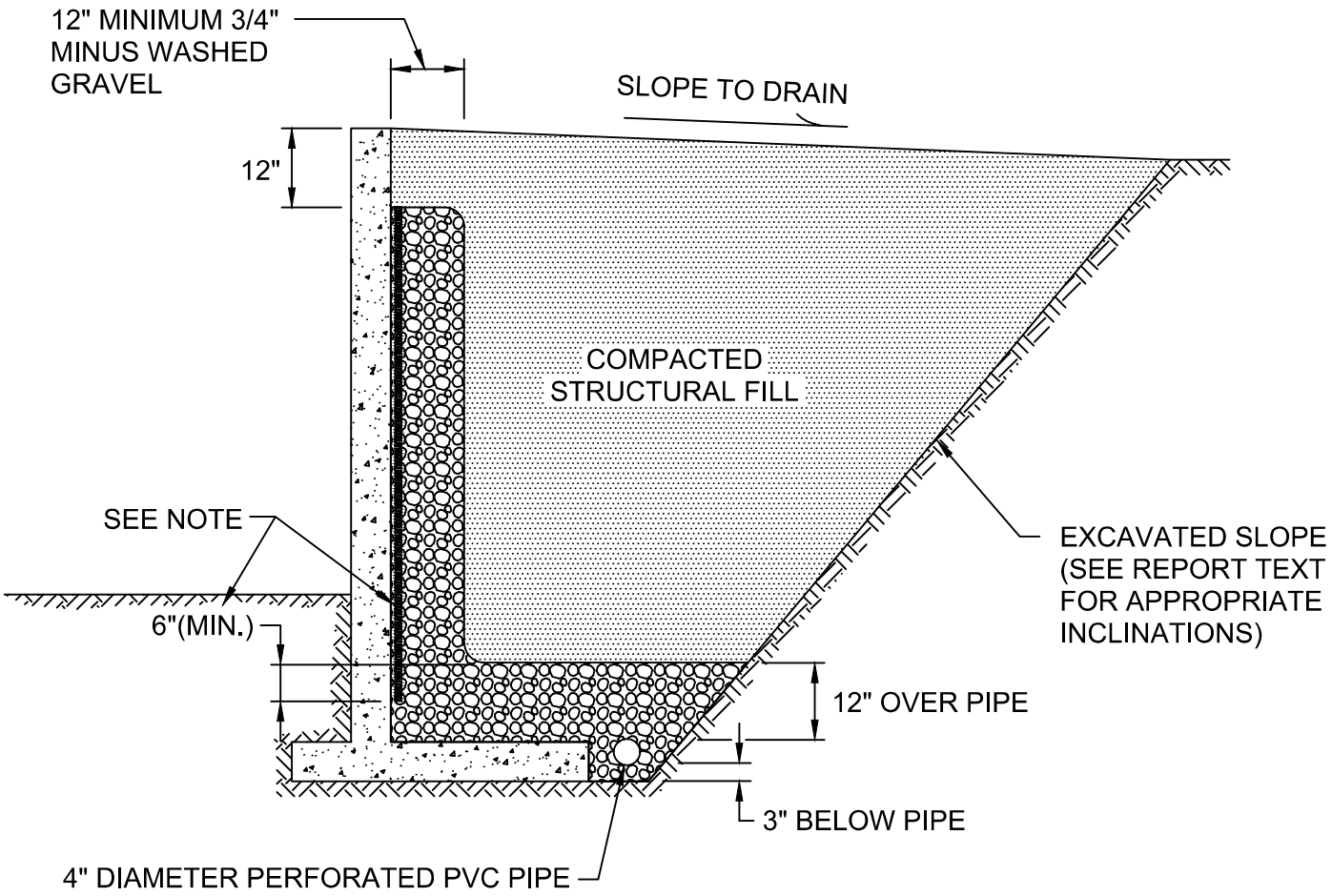
GENERALIZED SLOPE FILL DIAGRAM
WU PROPERTY
KIRKLAND, WASHINGTON

Proj. No.T-8671	Date DEC 2023	Figure 6



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
WU PROPERTY
KIRKLAND, WASHINGTON

Proj. No.T-8671	Date DEC 2023	Figure 7

APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING
Wu Property
Kirkland, Washington

We explored subsurface conditions at the site in seven test pits excavated to depths of about 8 to 10.5 feet using a track-mounted excavator, and in two test borings drilled to depths of 31.5 feet and 71 feet with a track-mounted drill rig using hollow-stem auger drilling methods. The test pit and test boring locations were approximately determined in the field by sighting and pacing relative to existing surface features. The approximate test pit and test boring locations are shown on Figure 2. The Test Pit and Test Boring Logs are presented as Figures A-2 through A-10.

An engineering geologist from our office conducted the field reconnaissance and observed the subsurface explorations. Our representative classified the soil conditions encountered, maintained a log of each test pit and test boring, obtained representative soil samples, and recorded groundwater levels. During drilling of the test borings, soil samples were obtained in general accordance with ASTM Test Designation D-1586. Using this procedure, a 2-inch (outside diameter) split barrel sampler is driven into the ground 18 inches using a 140-pound hammer free falling 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 pits and 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 Test Pit or Test Boring Log. Grain size analyses were performed on twelve soil samples. The test results are shown on Figures A-11 through A-15.

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

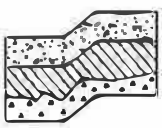
COHESIONLESS

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

I	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
WU PROPERTY
KIRKLAND, WASHINGTON

Proj. No.T-8671	Date DEC 2023	Figure A-1

LOG OF TEST PIT NO. 1

FIGURE A-2

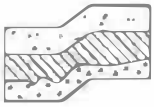
PROJECT NAME: Wu Property **PROJ. NO:** T-8671 **LOGGED BY:** JCS

LOCATION: Kirkland, Washington **SURFACE CONDITIONS:** Forest Duff **APPROX. ELEV:** 383

DATE LOGGED: May 9, 2022 **DEPTH TO GROUNDWATER:** NA **DEPTH TO CAVING:** NA

Depth (ft)	Sample No.	Description	Consistency/ Relative Density	W (%)
0		6 inches Duff and Tosoil.		
1		Brown SAND with gravel, fine to medium sand, fine to coarse gravel, moist. (SP)	Medium Dense	
2	1	Gray-brown SAND with silt and gravel to silty SAND with gravel, fine to medium sand, fine to coarse gravel, moist, mottled. (SP-SM/SM)		9.2
3				
4		Gray-brown SAND, fine grained, scattered fine to coarse gravel, moist. (SP)		
5	2			13.8
6		Gray-brown to gray SAND, fine to medium grained, scattered fine to coarse gravel, moist. (SP)	Medium Dense to Dense	
7				
8	3			13.8
9				
10	4			13.2
		Gray silty SAND with gravel, fine sand, fine to coarse gravel, moist, weakly cemented. (SM)	Dense	
11		Test pit terminated at 10.5 feet. No groundwater seepage.		
12				

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.



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LOG OF TEST PIT NO. 2

FIGURE A-3

PROJECT NAME: Wu Property **PROJ. NO:** T-8671 **LOGGED BY:** JCS

LOCATION: Kirkland, Washington **SURFACE CONDITIONS:** Forest Duff **APPROX. ELEV:** 340

DATE LOGGED: May 9, 2022 **DEPTH TO GROUNDWATER:** N A **DEPTH TO CAVING:** N A

Depth (ft)	Sample No.	Description	Consistency/ Relative Density	W (%)
0		10 inches Duff and Topsoil.		
1		Brown SAND, fine grained, moist. (SP)		
2	1			11.1
3		Gray-brown SAND, fine grained, moist. (SP)		
4				
5			Medium Dense	
6				
7	2			10.8
8				
9				
	3	Gray-brown SAND with gravel, fine to medium sand, fine to coarse gravel, moist. (SP)		7.9
10		Test pit terminated at 10 feet. No groundwater seepage.		
11				
12				

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. 3

FIGURE A-4

PROJECT NAME: Wu Property **PROJ. NO:** T-8671 **LOGGED BY:** JCS

LOCATION: Kirkland, Washington **SURFACE CONDITIONS:** Forest Duff **APPROX. ELEV:** 310

DATE LOGGED: May 9, 2022 **DEPTH TO GROUNDWATER:** 8.5 ft **DEPTH TO CAVING:** NA

Depth (ft)	Sample No.	Description	Consistency/ Relative Density	W (%)
0		1 inch Duff and Topsoil.		
1		Gray-brown SAND, fine grained, moist. (SP)		
2				
3	1		Medium Dense	9.1
4				
5				
6	2			13.6
		Gray-brown SAND, fine to coarse grained, scattered fine to coarse gravel, wet. (SP)		
7			Dense	
8				
▼				
9		Test pit terminated at 9 feet.		
		Very light groundwater seepage from localized points between 8.5 and 9 feet.		
10				
11				
12				

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. 4

FIGURE A-5

PROJECT NAME: Wu Property **PROJ. NO:** T-8671 **LOGGED BY:** JCS

LOCATION: Kirkland, Washington **SURFACE CONDITIONS:** Forest Duff **APPROX. ELEV:** 322

DATE LOGGED: May 9, 2022 **DEPTH TO GROUNDWATER:** 7.5 ft **DEPTH TO CAVING:** NA

Depth (ft)	Sample No.	Description	Consistency/ Relative Density	W (%)
0		6 inches Duff and Topsoil.		
1		Fill: Dark gray silty SAND to SAND with silt, fine sand, moist. (SM/SP-SM)		
2		Brown SAND, fine grained, moist. (SP)		
3				
4			Medium Dense	
5	1	Gray-brown SAND, fine to medium grained, moist, scattered mottling. (SP)		10.8
6		- Wet below 6 feet.		
7				
▼	2			18.4
8		Gray-brown SAND with gravel, fine to coarse sand, fine to coarse gravel, wet. (SP)		
		Test pit terminated at 8 feet. Light groundwater seepage at 7.5 feet.		
9				
10				
11				
12				

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. 101

FIGURE A-6

PROJECT NAME: Wu Property **PROJ. NO:** T-8671 **LOGGED BY:** JCS

LOCATION: Kirkland, Washington **SURFACE CONDITIONS:** Forest Duff **APPROX. ELEV:** 322

DATE LOGGED: October 24, 2023 **DEPTH TO GROUNDWATER:** 9 ft **DEPTH TO CAVING:** NA

Depth (ft)	Sample No.	Description	Consistency/ Relative Density	W (%)
0		6 inches Duff and Topsoil.		
1	1	Red-brown silty SAND, fine grained, scattered fine to coarse gravel, moist, numerous roots. (SM)		14.0
2		Gray-brown silty SAND, fine grained, scattered, fine to coarse gravel, moist, mottled. (SM)	Medium Dense	
3				
4				
5	2	Gray-brown silty SAND to SAND with silt, fine sand, trace of fine to coarse gravel, moist. (SM/SP-SM)		10.4
6	3	Gray-brown SAND with silt, fine to medium sand, trace to scattered fine to coarse gravel, moist. (SP-SM)		10.8
7				
8	4	- Wet below 8 feet.	Medium Dense to Dense	19.6
▼ 9				
10	5	Test pit terminated at 10 feet. Moderate to heavy groundwater seepage below 9 feet.		19.8
11				
12				

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. 102

FIGURE A-7

PROJECT NAME: Wu Property **PROJ. NO:** T-8671 **LOGGED BY:** JCS

LOCATION: Kirkland, Washington **SURFACE CONDITIONS:** Forest Duff **APPROX. ELEV:** 327

DATE LOGGED: October 24, 2023 **DEPTH TO GROUNDWATER:** NA **DEPTH TO CAVING:** NA

Depth (ft)	Sample No.	Description	Consistency/ Relative Density	W (%)
0		6 inches Duff and Topsoil.		
1		Red-brown silty SAND to SAND with silt, fine sand, moist, numerous roots. (SM/SP-SM)		
	1			8.8
2		Gray-brown SAND to SAND with silt, fine grained, moist. (SP/SP-SM)		
3				
4				
5			Medium Dense	
6	2			5.3
7				
	3	- Faint mottling and trace of fine to coarse gravel at 7 feet.		8.1
8				
9				
10	4			6.6
		Test pit terminated at 10 feet. No groundwater seepage.		
11				
12				

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF PILOT INFILTRATION TEST NO. 1

FIGURE A-8

PROJECT NAME: Wu Property **PROJ. NO:** T-8671 **LOGGED BY:** JCS

LOCATION: Kirkland, Washington **SURFACE CONDITIONS:** Forest Duff **APPROX. ELEV:** 327

DATE LOGGED: October 24, 2023 **DEPTH TO GROUNDWATER:** NA **DEPTH TO CAVING:** NA

Depth (ft)	Sample No.	Description	Consistency/ Relative Density	W (%)
0		6 inches Duff and Topsoil.		
1		Red-brown silty SAND, fine grained, scattered fine to coarse gravel, moist, numerous roots. (SM)		
2		Gray-brown silty SAND to SAND with silt, fine sand, scattered, fine to coarse gravel, moist, mottled, trace of fine roots. (SM/SP-SM)		
3				
4		- Approximate infiltration test depth.		
5		Gray-brown SAND with silt to SAND, fine to medium grained, trace of fine to coarse gravel, wet. (SP-SM/SP)	Medium Dense	
6				
7		- Grades to moist below about 7.5 feet.		
8				
9				
10	1			5.5
11		Test pit terminated at 10 feet. No groundwater seepage. Soil descriptions below 4.5 feet are post-test conditions.		
12				

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF BORING NO. 4

Figure No. A-9

Project: Wu Property **Project No:** T-8671 **Date Drilled:** May 10, 2022

Client: BLU Development, LLC **Driller:** Boretec **Logged By:** JCS

Location: Kirkland, Washington **Depth to Groundwater:** 65 ft **Approx. Elev:** 372

Depth (ft)	Soil Description	Consistency/ Relative Density	SPT (N) Blows/foot	Moisture Content (%)
0	Brown SAND with silt and gravel, fine sand, fine to coarse gravel, moist. (SP-SM) (Weathered advance outwash)	Medium Dense	22	6.4
5			27	7.2
	Gray-brown SAND with silt to silty SAND, fine sand, trace of fine to coarse gravel, moist. (SP-SM/SM) (Weathered advance outwash)		15	8.0
10			20	8.1
			21	8.9
15	Gray-brown SAND with silt, fine to medium grained, moist, trace of silty fine sand seams and pockets. (SP-SM) (Advance outwash)	Dense	36	7.8
20			40	5.8
	Gray to gray-brown SAND with silt, fine grained, moist. (SP-SM) (Advance outwash)		47	5.6
25				
30			38	5.0
35	- Scattered light gray-brown silty fine sand seams between 35 and 36.5 feet.		40	11.7
40		Very Dense	55	6.7
45			62	6.1
50			66	6.4
55			70	7.8
60			90	11.1
▼65	Gray-brown SAND with gravel, fine to medium sand, fine to coarse gravel, wet, trace of silty fine sand layers. (SP) (Advance outwash)		50/6"	15.5
70	Gray SILT, moist to wet, low plasticity, scattered mottling. (ML) (Glaciolacustrine deposit)		50/6"	26.7
75	Boring terminated at 71 feet. Groundwater encountered at 65 feet.			
80				

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. 5

Figure No. A-10

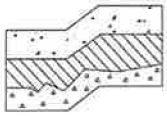
Project: Wu Property **Project No:** T-8671 **Date Drilled:** May 10, 2022

Client: BLU Development, LLC **Driller:** Boretec **Logged By:** JCS

Location: Kirkland, Washington **Depth to Groundwater:** 20 ft **Approx. Elev:** 324

Depth (ft)	Soil Description	Consistency/ Relative Density	SPT (N) Blows/foot	Moisture Content (%)
0	Brown SAND with silt, fine grained, moist. (SP-SM) (Weathered advance outwash)	Loose	6	9.9
5	Gray-brown SAND with silt, fine grained, trace of fine to coarse gravel, moist. (SP-SM) (Weathered advance outwash)	Medium Dense	16	8.9
	- Scattered fine sand with silt to silty fine sand seams and layers between 7.5 and 14 feet.		21	14.2
10		Dense	30	14.4
	- Locally wet between 12.5 and 14 feet.	Medium Dense	29	14.2
15		Dense	45	10.7
▼20	- Wet below 20 feet.		48	
	Gray-brown SILT, moist, low plasticity, mottled. (ML) (Glaciolacustrine deposit)			18.4
	Gray-brown SAND, fine to coarse grained, wet. (SP)			
25	Gray SILT to SILT with sand, fine sand, wet, nonplastic to low plasticity. (ML) (Glaciolacustrine deposit)		41	27.0
30	- Moist below 30 feet.		44	25.9
35	Boring terminated at 31.5 feet. Wet soils encountered between 20 and 26.5 feet.			

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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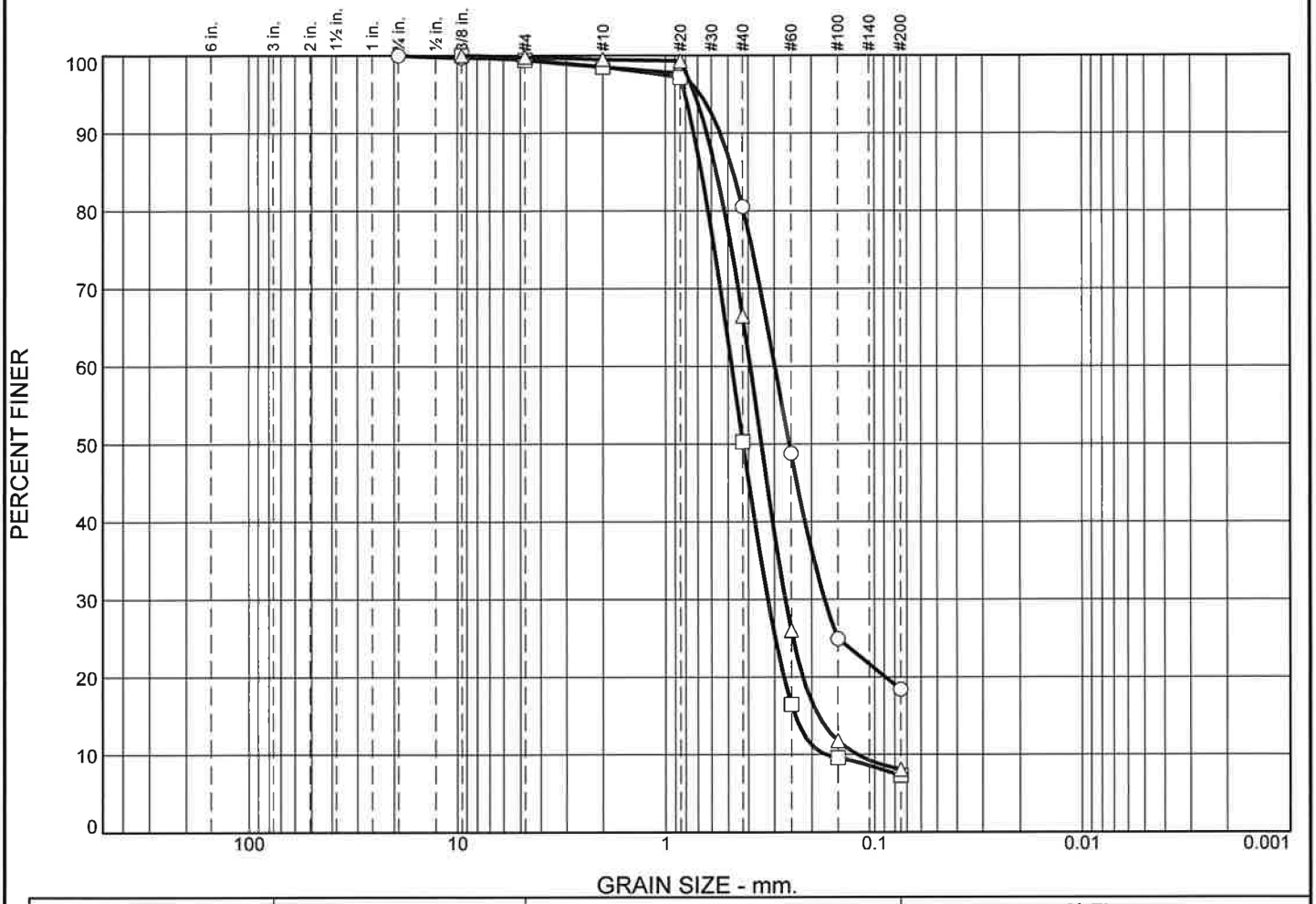
Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.6	0.9	18.0	62.1	18.4	
□	0.0	0.0	0.6	0.9	48.2	43.0	7.3	
△	0.0	0.0	0.2	0.3	33.0	58.4	8.1	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.4711	0.2989	0.2550	0.1736				
□			0.6711	0.4796	0.4234	0.3231	0.2392	0.1723	1.26	2.78
△			0.5687	0.3912	0.3465	0.2670	0.1855	0.1213	1.50	3.23

Material Description	USCS	AASHTO
○ silty SAND (USDA Textural Classification - Loamy Sand)	SM	
□ SAND with silt (USDA Textural Classification - (Sand)	SP-SM	
△ SAND with silt	SP-SM	

Project No. T-8671 **Client:** BLU Development, LLC

Project: Wu Property

○ **Location:** B-4 **Depth:** 10'

□ **Location:** B-4 **Depth:** 30'

△ **Location:** B-4 **Depth:** 50'

Remarks:

○ Tested June 8, 2022

□ Tested June 8, 2022

△ Tested June 8, 2022

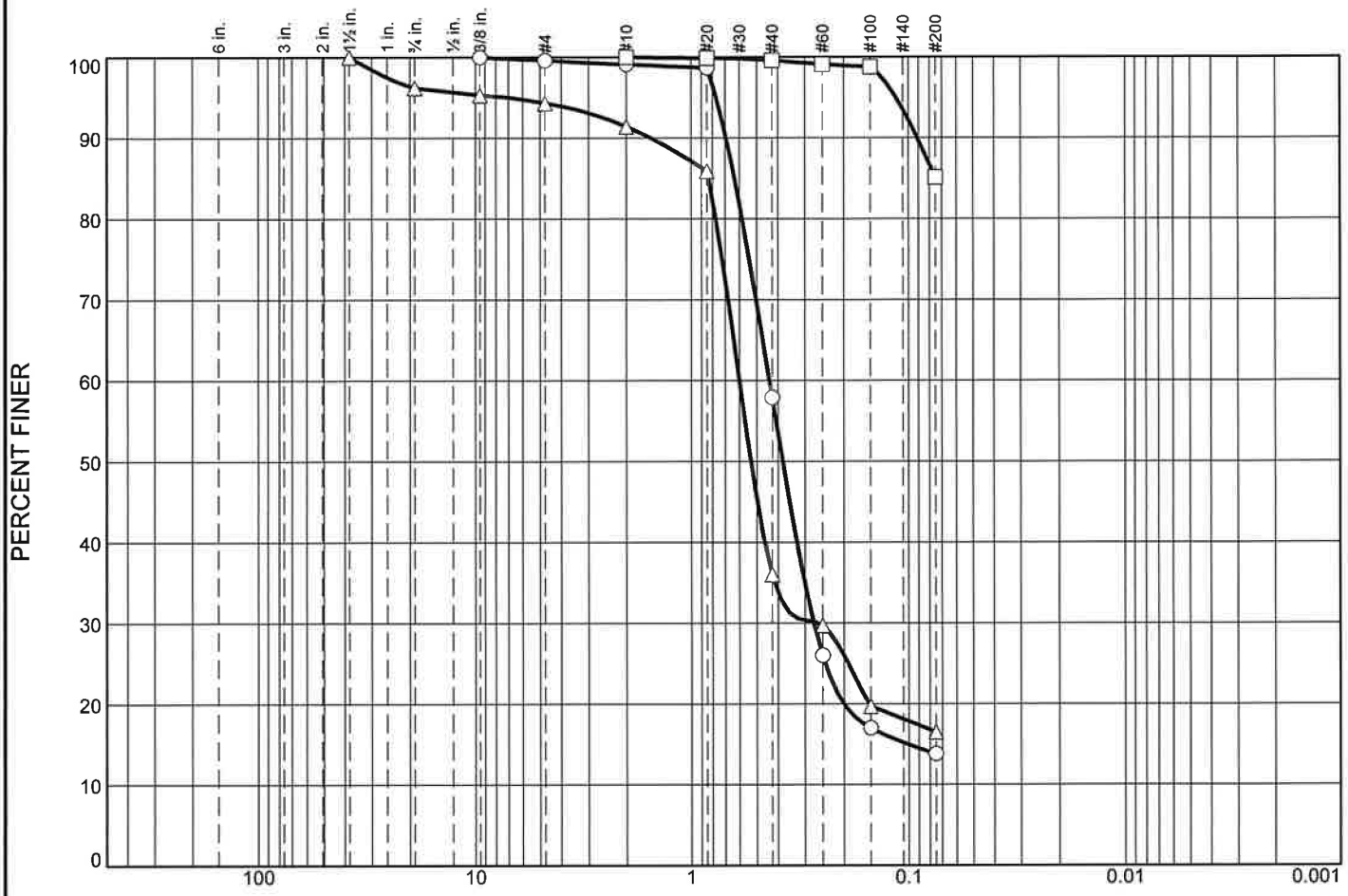
Terra Associates, Inc.

Kirkland, WA

Figure A-11

Tested By: KJ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.4	0.5	41.2	44.1	13.8	
□	0.0	0.0	0.0	0.0	0.4	14.5	85.1	
△	0.0	3.8	1.9	2.9	55.4	19.5	16.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.6331	0.4376	0.3802	0.2740	0.1016			
□										
△			0.8363	0.6011	0.5316	0.2612				

Material Description	USCS	AASHTO
○ silty SAND (USDA Textural Classification - Sand)	SM	
□ SILT with sand	ML	
△ silty SAND (USDA Textural Classification - Loamy Sand)	SM	

Project No. T-8671 **Client:** BLU Development, LLC

Project: Wu Property

○ **Location:** B-5 **Depth:** 10'

□ **Location:** B-5 **Depth:** 25'

△ **Location:** TP-101 **Depth:** 1.5'

Remarks:

○ Tested June 8, 2022

□ Tested June 8, 2022

△ Tested November 4, 2023

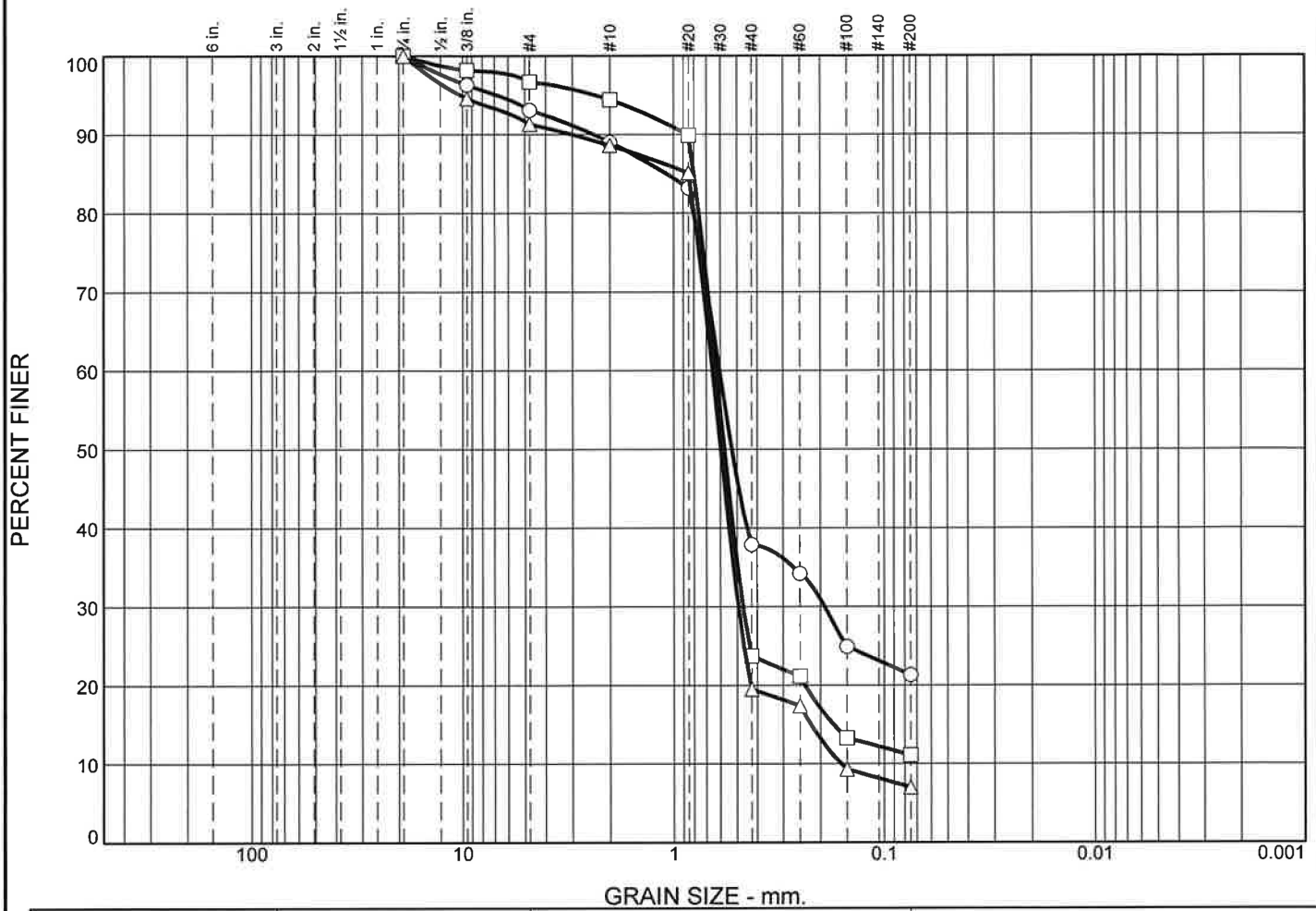
Terra Associates, Inc.

Kirkland, WA

Figure A-12

Tested By: KJ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	6.9	4.1	51.1	16.6	21.3	
□	0.0	0.0	3.3	2.3	70.7	12.6	11.1	
△	0.0	0.0	8.7	2.7	69.1	12.5	7.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.0803	0.6063	0.5296	0.1909				
□			0.7990	0.6281	0.5746	0.4679	0.1737			
△			0.8488	0.6541	0.5982	0.4926	0.2216	0.1597	2.32	4.10

Material Description	USCS	AASHTO
○ silty SAND (USDA Textural Classification - Loamy Sand)	SM	
□ SAND with silt (USDA Textural Classification - Sand)	SP-SM	
△ SAND with silt (USDA Textural Classification - Sand)	SP-SM	

Project No. T-8671 **Client:** BLU Development, LLC

Project: Wu Property

○ **Location:** TP-101 **Depth:** 5.5'

□ **Location:** TP-101 **Depth:** 6.5'

△ **Location:** TP-101 **Depth:** 8'

Remarks:

○ Tested November 4, 2023

□ Tested November 4, 2023

△ Tested November 4, 2023

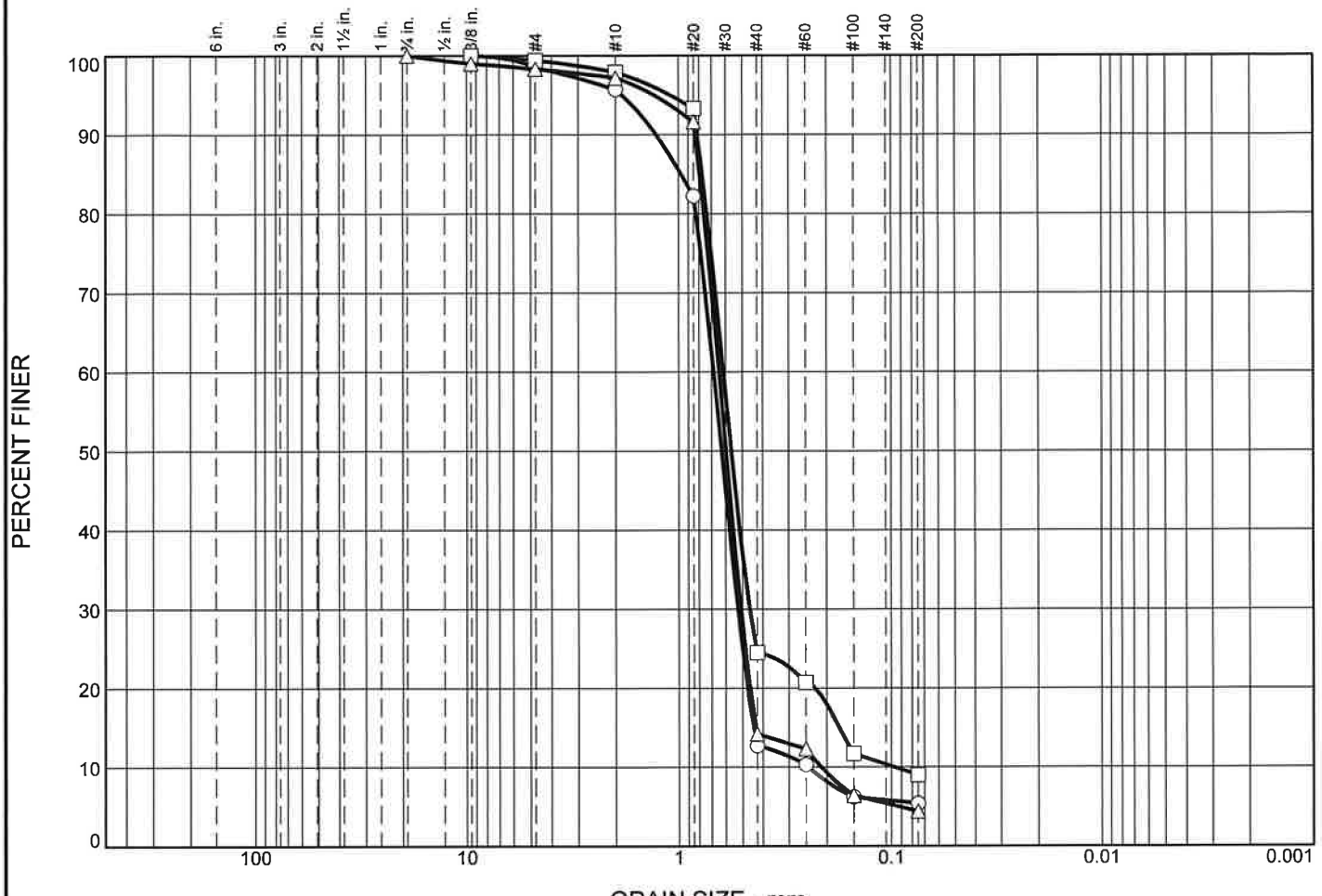
Terra Associates, Inc.

Kirkland, WA

Figure A-13

Tested By: KJ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.5	2.8	83.0	7.3	5.4	
□	0.0	0.0	0.6	1.5	73.4	15.5	9.0	
△	0.0	0.0	1.7	1.1	83.0	9.8	4.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.9710	0.6826	0.6267	0.5251	0.4418	0.2431	1.66	2.81
□			0.7718	0.6157	0.5647	0.4614	0.1750	0.0970	3.57	6.35
△			0.7925	0.6447	0.5977	0.5084	0.4305	0.2122	1.89	3.04

Material Description	USCS	AASHTO
○ SAND with silt (USDA Textural Classification - Sand)	SP-SM	
□ SAND with silt (USDA Textural Classification - Sand)	SP-SM	
△ SAND (USDA Textural Classification - Sand)	SP	

Project No. T-8671 **Client:** BLU Development, LLC

Project: Wu Property

○ **Location:** TP-101 **Depth:** 10'

□ **Location:** TP-102 **Depth:** 1.5'

△ **Location:** TP-102 **Depth:** 6'

Remarks:

○ Tested November 4, 2023

□ Tested November 4, 2023

△ Tested November 4, 2023

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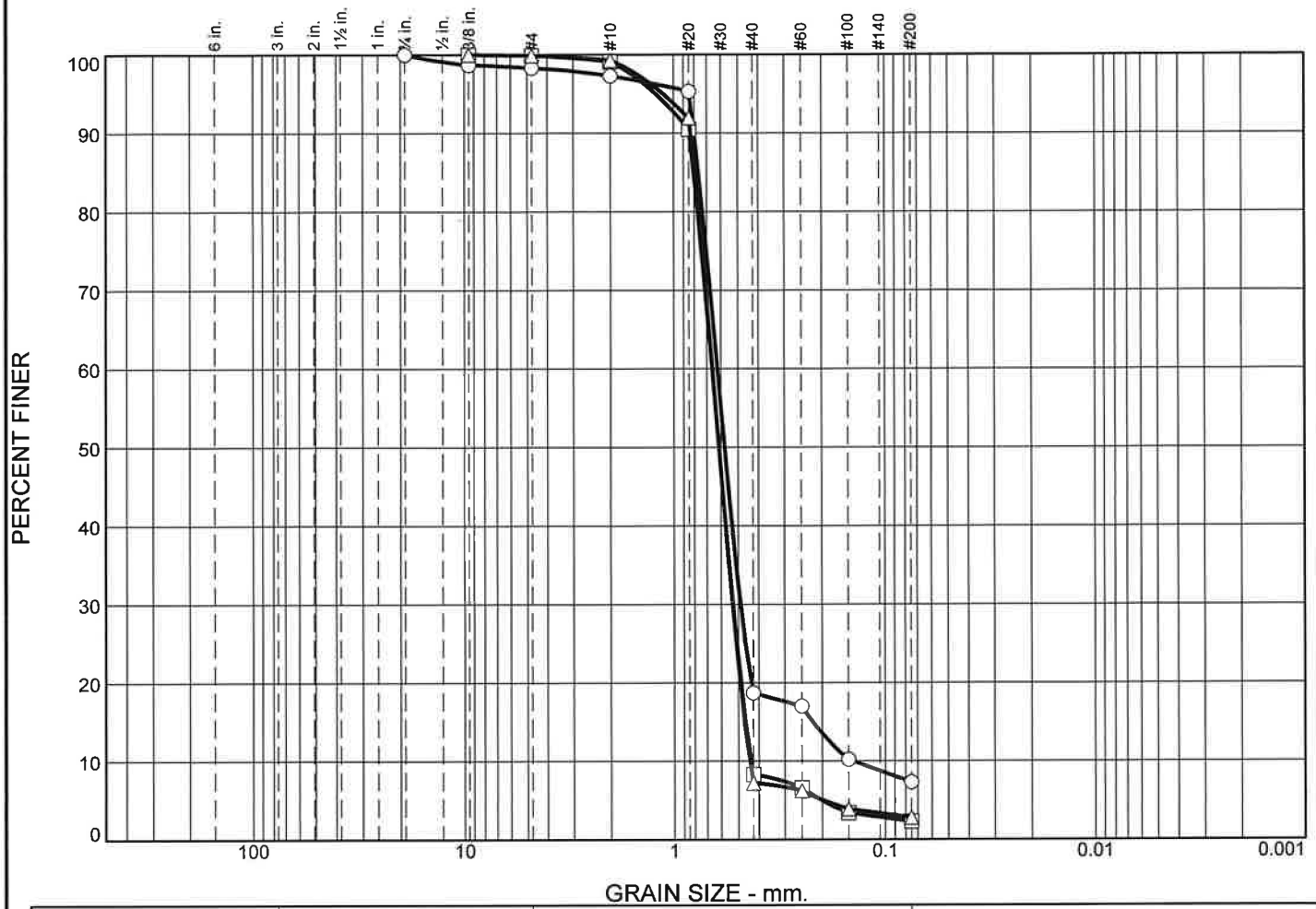
Kirkland, WA

Figure A-14

Tested By: KJ

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.7	1.0	78.6	11.4	7.3	
□	0.0	0.0	0.1	0.8	90.8	6.0	2.3	
△	0.0	0.0	0.1	0.6	92.1	4.4	2.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.7638	0.6242	0.5781	0.4879	0.2211	0.1430	2.67	4.36
□			0.8042	0.6598	0.6142	0.5295	0.4627	0.4357	0.98	1.51
△			0.7952	0.6574	0.6133	0.5313	0.4670	0.4417	0.97	1.49

Material Description	USCS	AASHTO
○ SAND with silt (USDA Textural Classification - Sand)	SP-SM	
□ SAND (USDA Textural Classification - Sand)	SP	
△ SAND (USDA Textural Classification - Sand)	SP	

Project No. T-8671 **Client:** BLU Development, LLC

Project: Wu Property

○ **Location:** TP-102 **Depth:** 7.5'

□ **Location:** TP-102 **Depth:** 10'

△ **Location:** PIT-1 **Depth:** 10'

Remarks:

○ Tested November 4, 2023

□ Tested November 4, 2023

△ Tested November 4, 2023

Terra Associates, Inc.

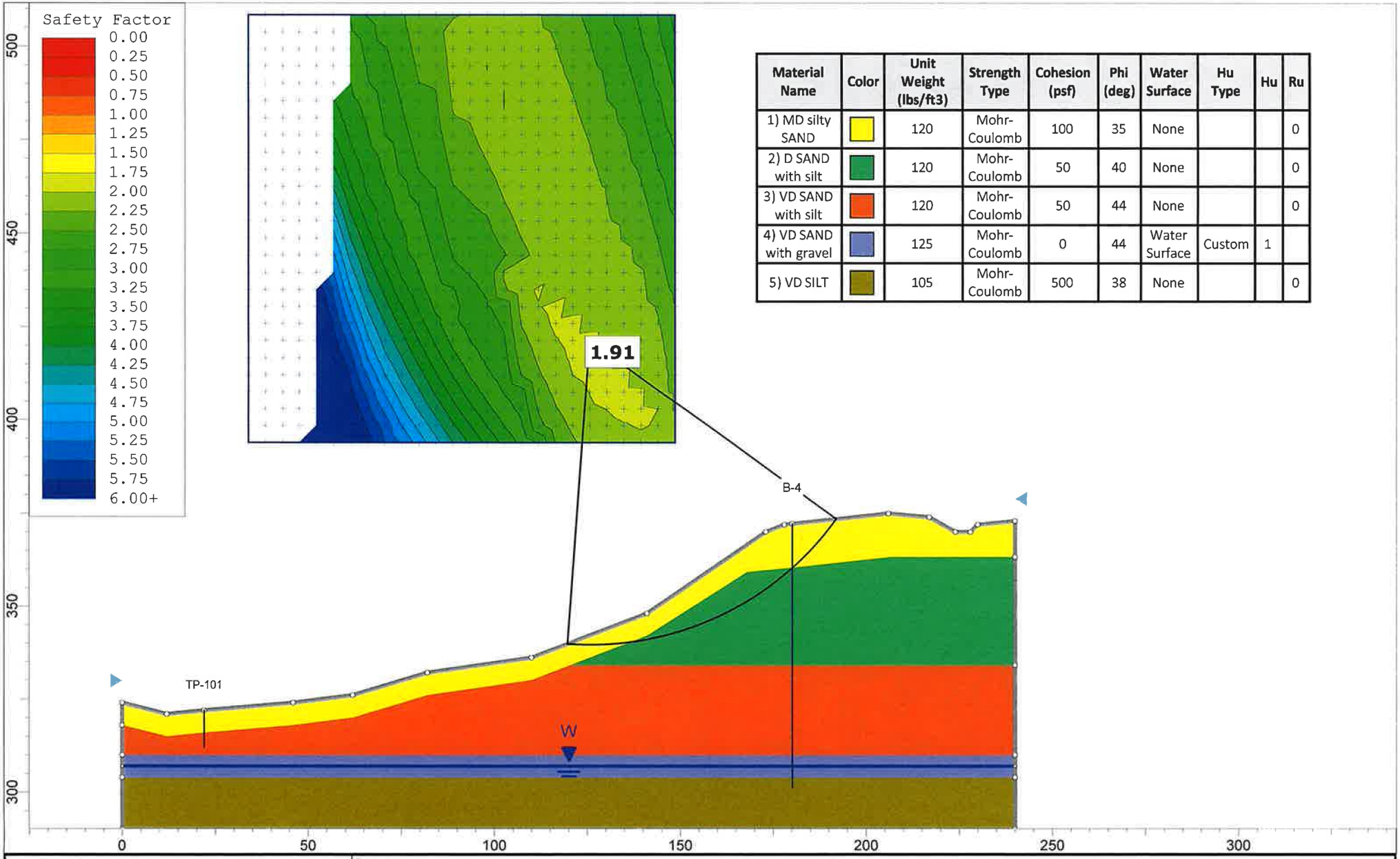
Kirkland, WA

Figure A-15

Tested By: KJ

APPENDIX B

STABILITY ANALYSIS RESULTS

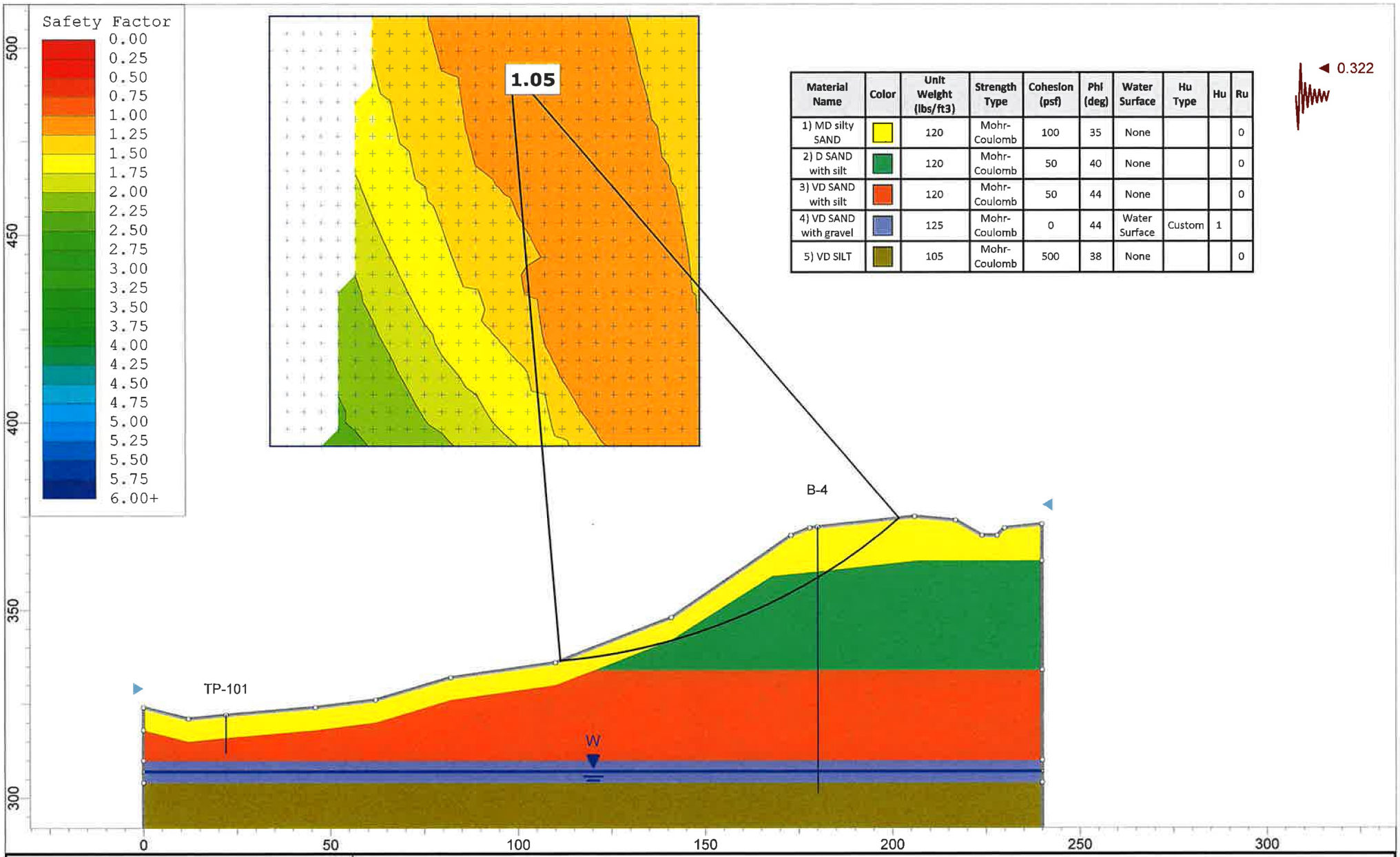


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35	None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40	None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44	None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44	Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38	None			0

rocscience

SLIDEINTERPRET 9.009

Project	Wu Property.slmd		
	A-A" Existing Static		
Drawn By	JCS	*Company*	Terra Associates, Inc.
Date	12/12/2023	*File Name*	Wu Property.slmd

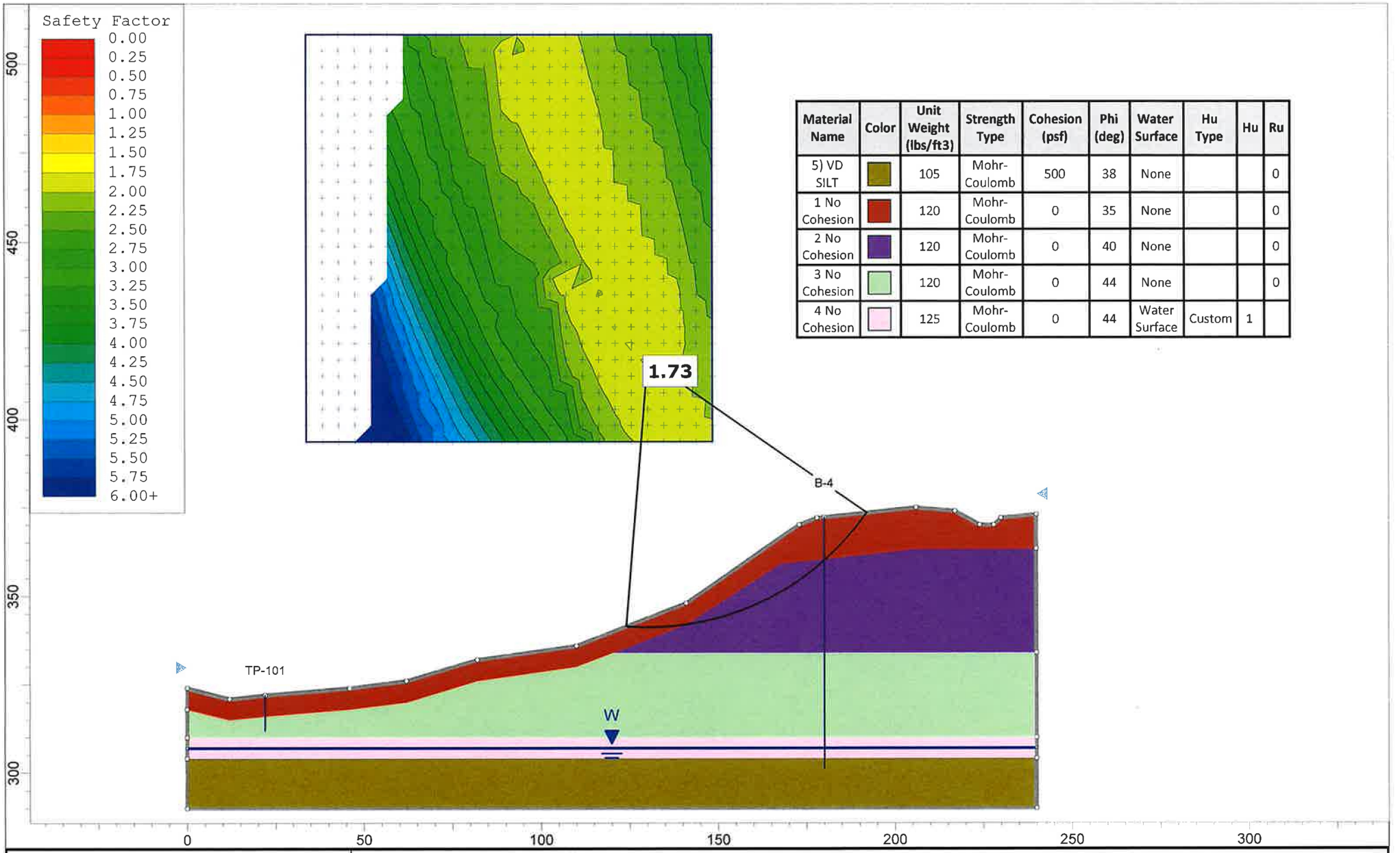


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35	None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40	None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44	None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44	Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38	None			0

rocscience

SLIDEINTERPRET 9.009

Project	Wu Property.slmd
	A-A" Existing Pseudostatic
Drawn By: JCS	Company: Terra Associates, Inc.
Date: 12/12/2023	File Name: Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
5) VD SILT		105	Mohr-Coulomb	500	38	None			0
1 No Cohesion		120	Mohr-Coulomb	0	35	None			0
2 No Cohesion		120	Mohr-Coulomb	0	40	None			0
3 No Cohesion		120	Mohr-Coulomb	0	44	None			0
4 No Cohesion		125	Mohr-Coulomb	0	44	Water Surface	Custom	1	

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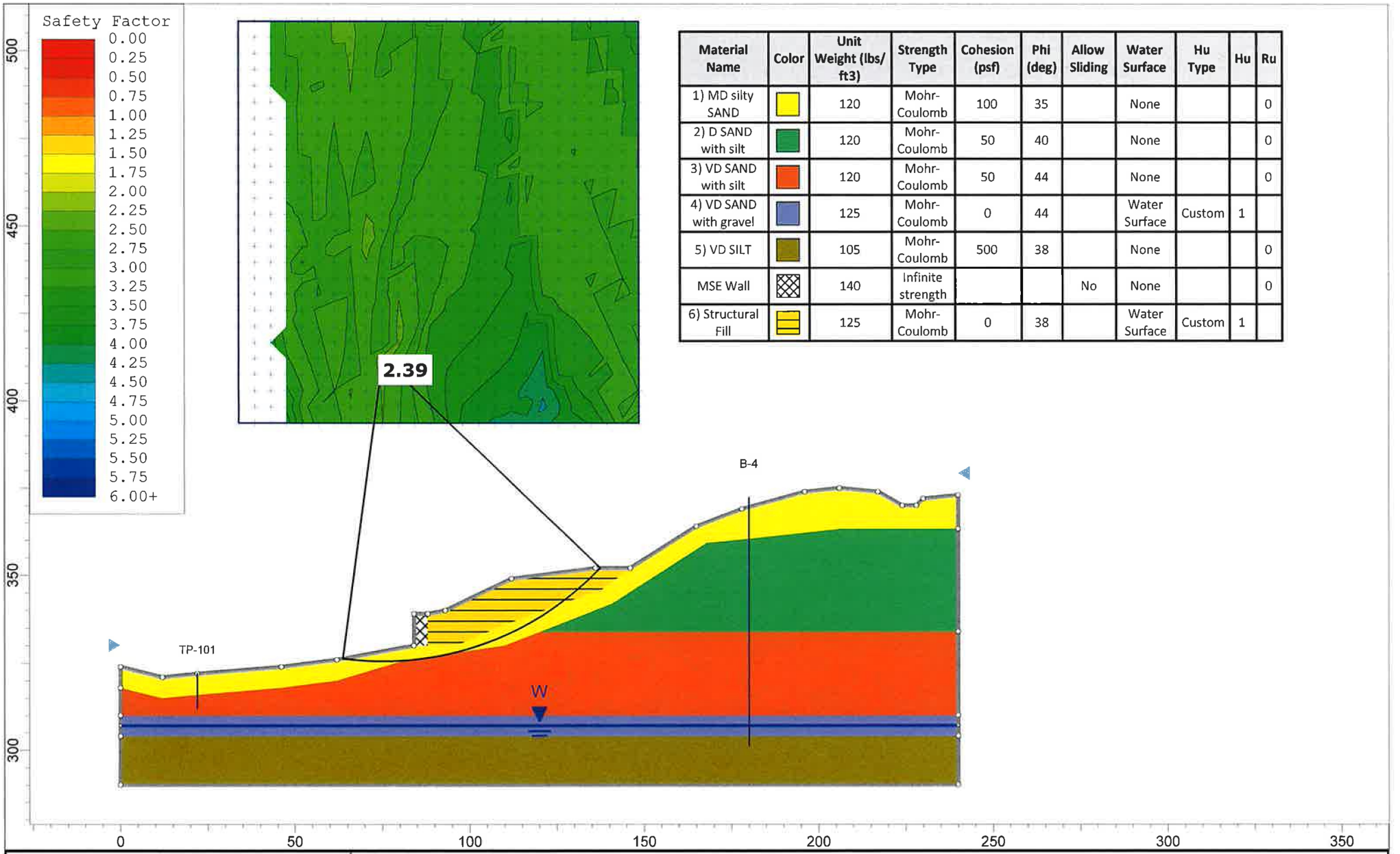
SLIDEINTERPRET 9.009

Project	Wu Property.slmd
	A-A" Existing No Cohesion
Drawn By	JCS
Company	Terra Associates, Inc.
Date	12/12/2023
File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35		None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40		None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44		None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44		Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38		None			0
MSE Wall		140	Infinite strength			No	None			0
6) Structural Fill		125	Mohr-Coulomb	0	38		Water Surface	Custom	1	

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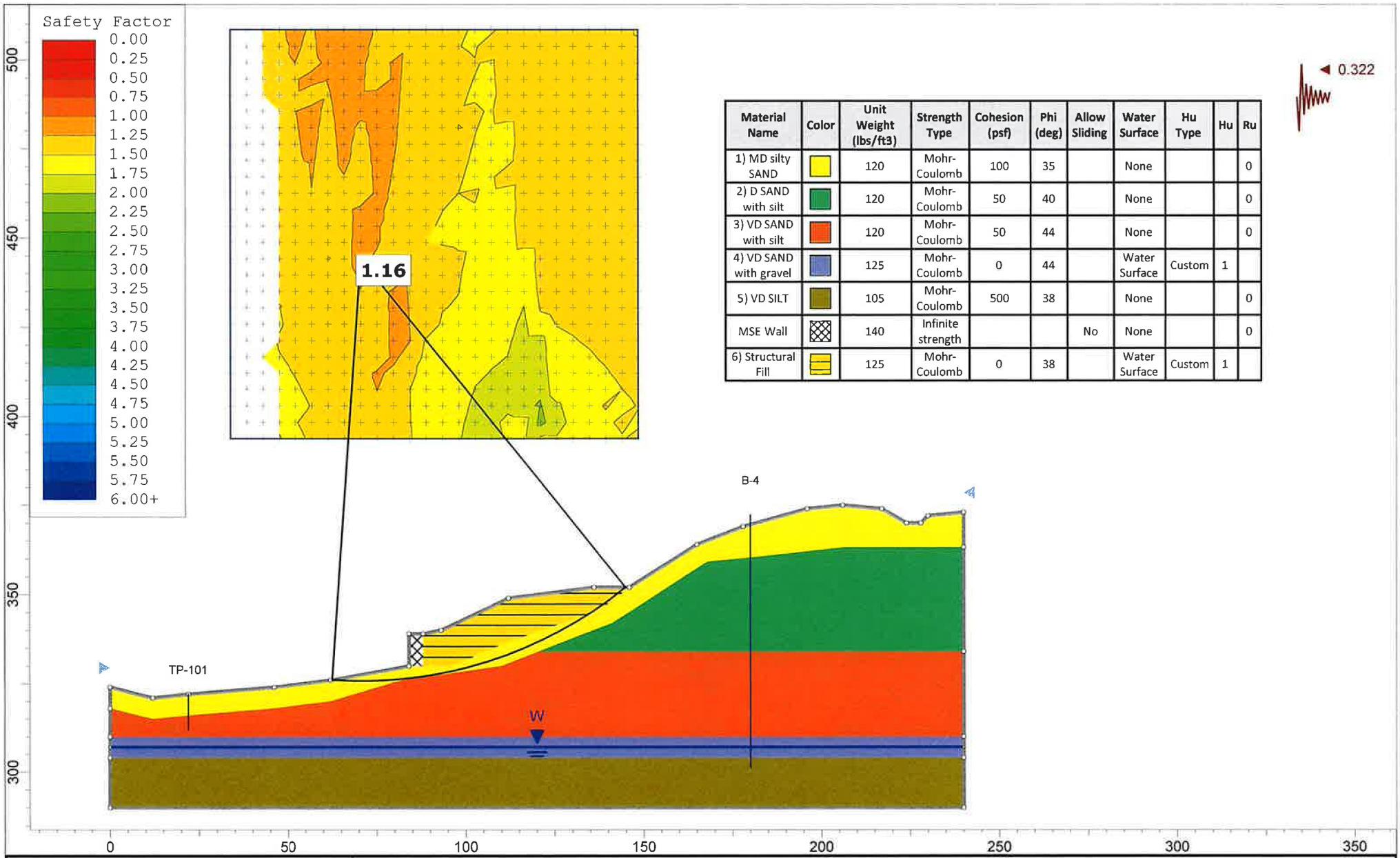
SLIDEINTERPRET 9.009

Project	Wu Property.slmd		
	A-A' Proposed Static		
Drawn By	JCS	*Company*	Terra Associates, Inc.
Date	12/12/2023	*File Name*	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35		None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40		None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44		None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44		Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38		None			0
MSE Wall		140	Infinite strength			No	None			0
6) Structural Fill		125	Mohr-Coulomb	0	38		Water Surface	Custom	1	

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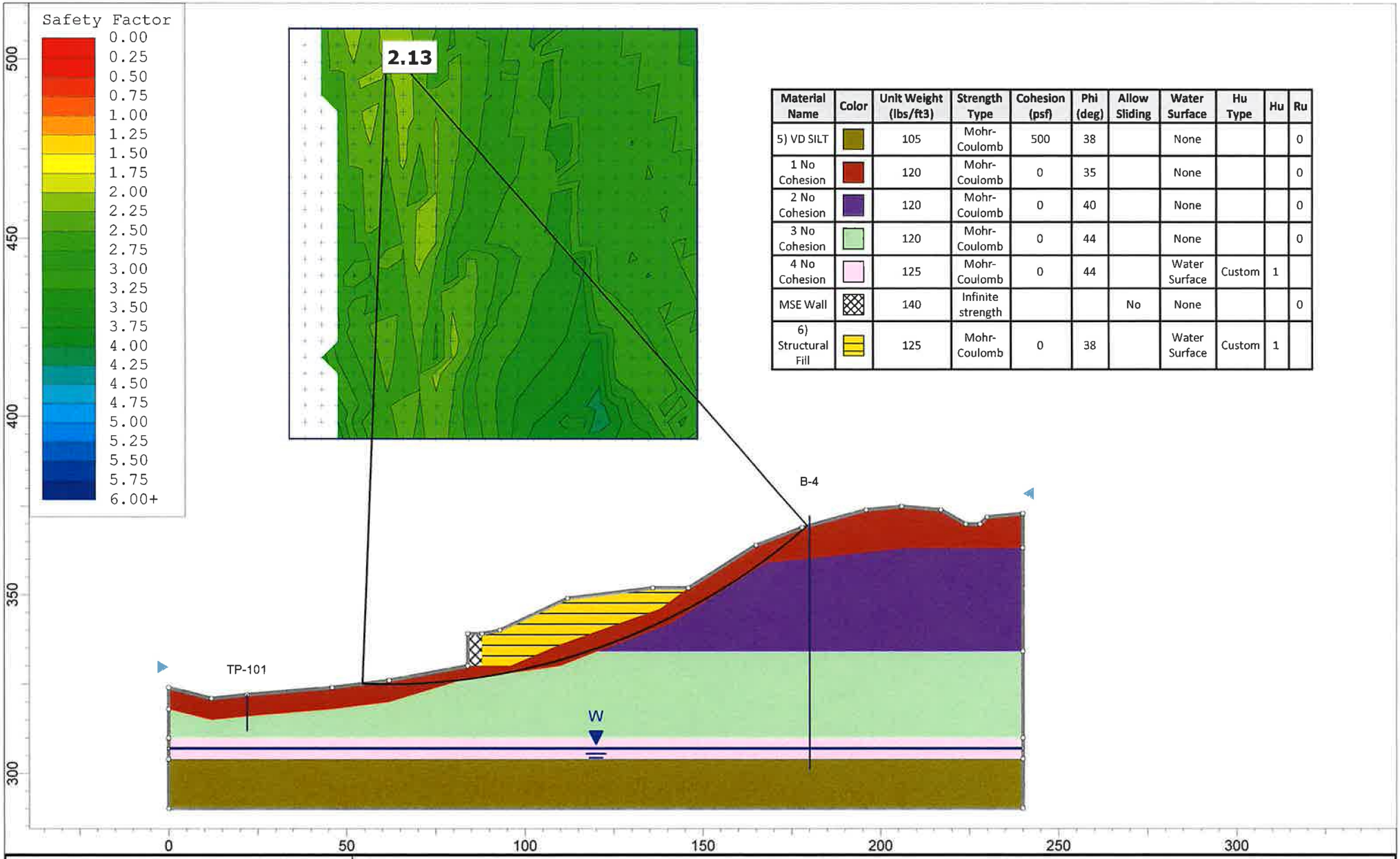
SLIDEINTERPRET 9.009

Project	Wu Property.slmd		
	A-A' Proposed Pseudostatic		
Drawn By	JCS	Company	Terra Associates, Inc.
Date	12/12/2023	File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding	Water Surface	Hu Type	Hu	Ru
5) VD SILT		105	Mohr-Coulomb	500	38		None			0
1 No Cohesion		120	Mohr-Coulomb	0	35		None			0
2 No Cohesion		120	Mohr-Coulomb	0	40		None			0
3 No Cohesion		120	Mohr-Coulomb	0	44		None			0
4 No Cohesion		125	Mohr-Coulomb	0	44		Water Surface	Custom	1	
MSE Wall		140	Infinite strength			No	None			0
6) Structural Fill		125	Mohr-Coulomb	0	38		Water Surface	Custom	1	

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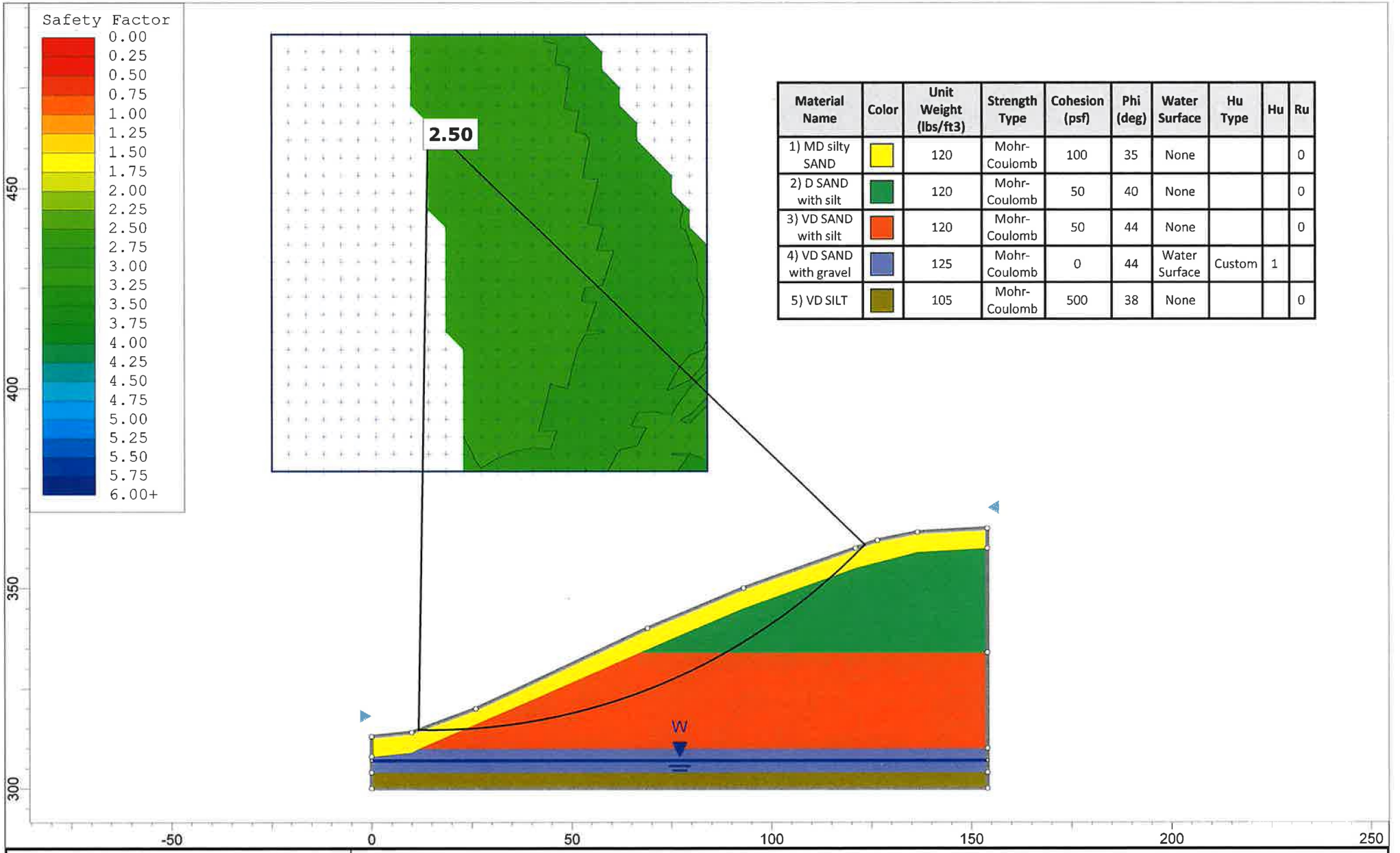
SLIDEINTERPRET 9.009

Project	Wu Property.slmd
	A-A' Proposed No Cohesion
Drawn By	JCS
Company	Terra Associates, Inc.
Date	12/12/2023
File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35	None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40	None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44	None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44	Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38	None			0

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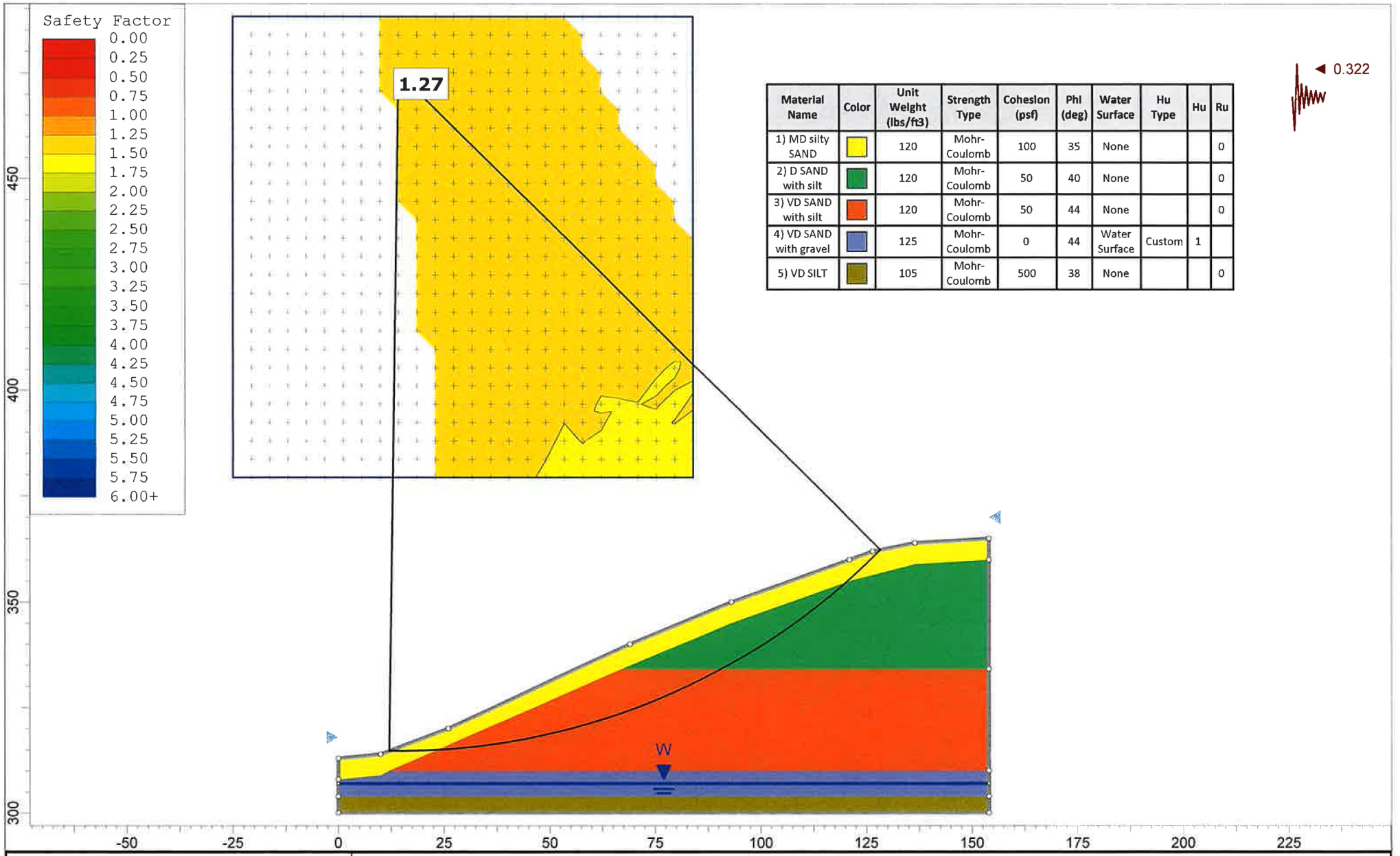
SLIDEINTERPRET 9.009

Project	Wu Property.slmd
	B-B' Existing Static
Drawn By	JCS
Company	Terra Associates, Inc.
Date	12/13/2023
File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35	None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40	None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44	None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44	Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38	None			0

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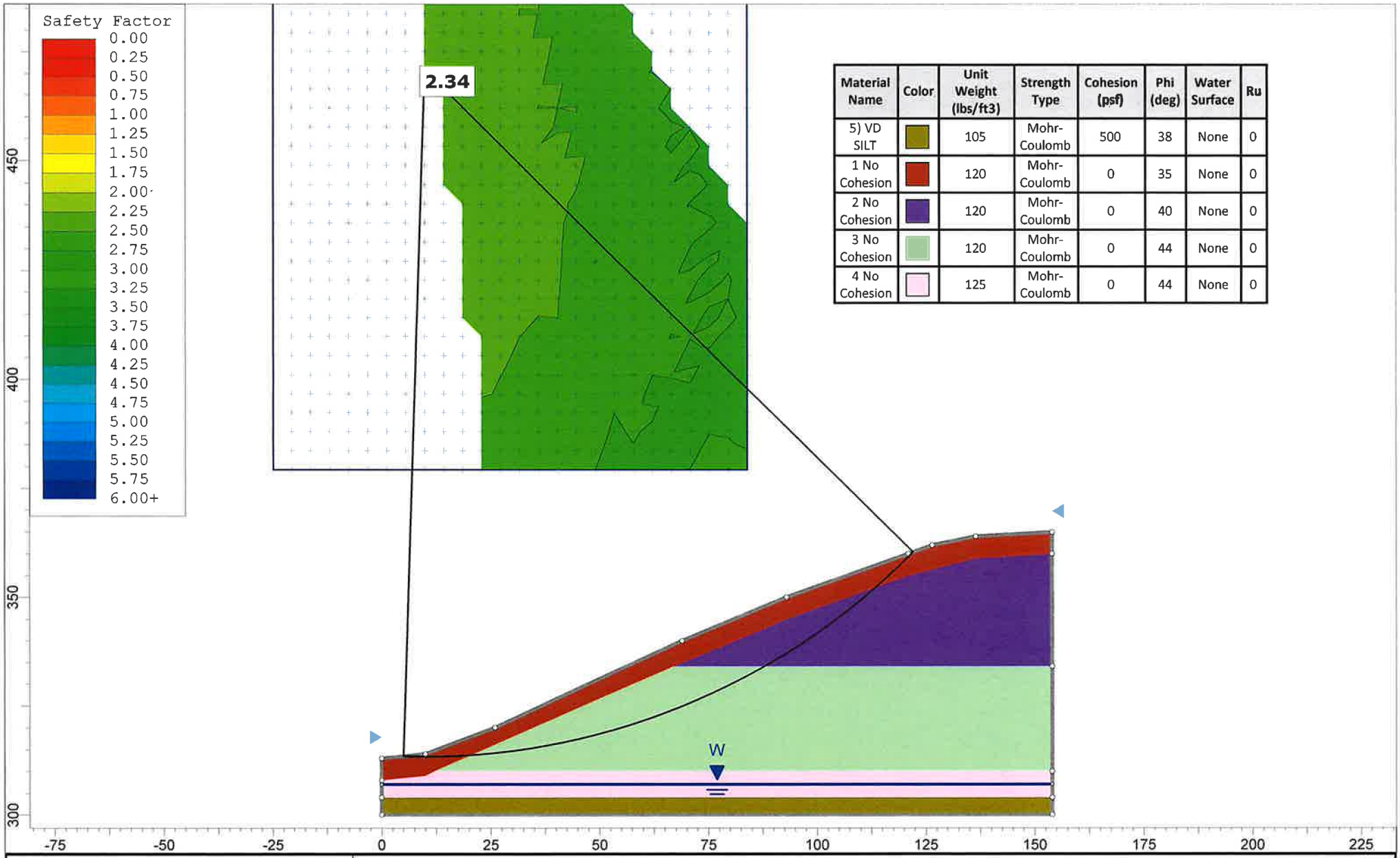
SLIDEINTERPRET 9.009

Project	Wu Property.slmd		
	B-B' Existing Pseudostatic		
Drawn By	JCS	Company	Terra Associates, Inc.
Date	12/13/2023	File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
5) VD SILT		105	Mohr-Coulomb	500	38	None	0
1 No Cohesion		120	Mohr-Coulomb	0	35	None	0
2 No Cohesion		120	Mohr-Coulomb	0	40	None	0
3 No Cohesion		120	Mohr-Coulomb	0	44	None	0
4 No Cohesion		125	Mohr-Coulomb	0	44	None	0

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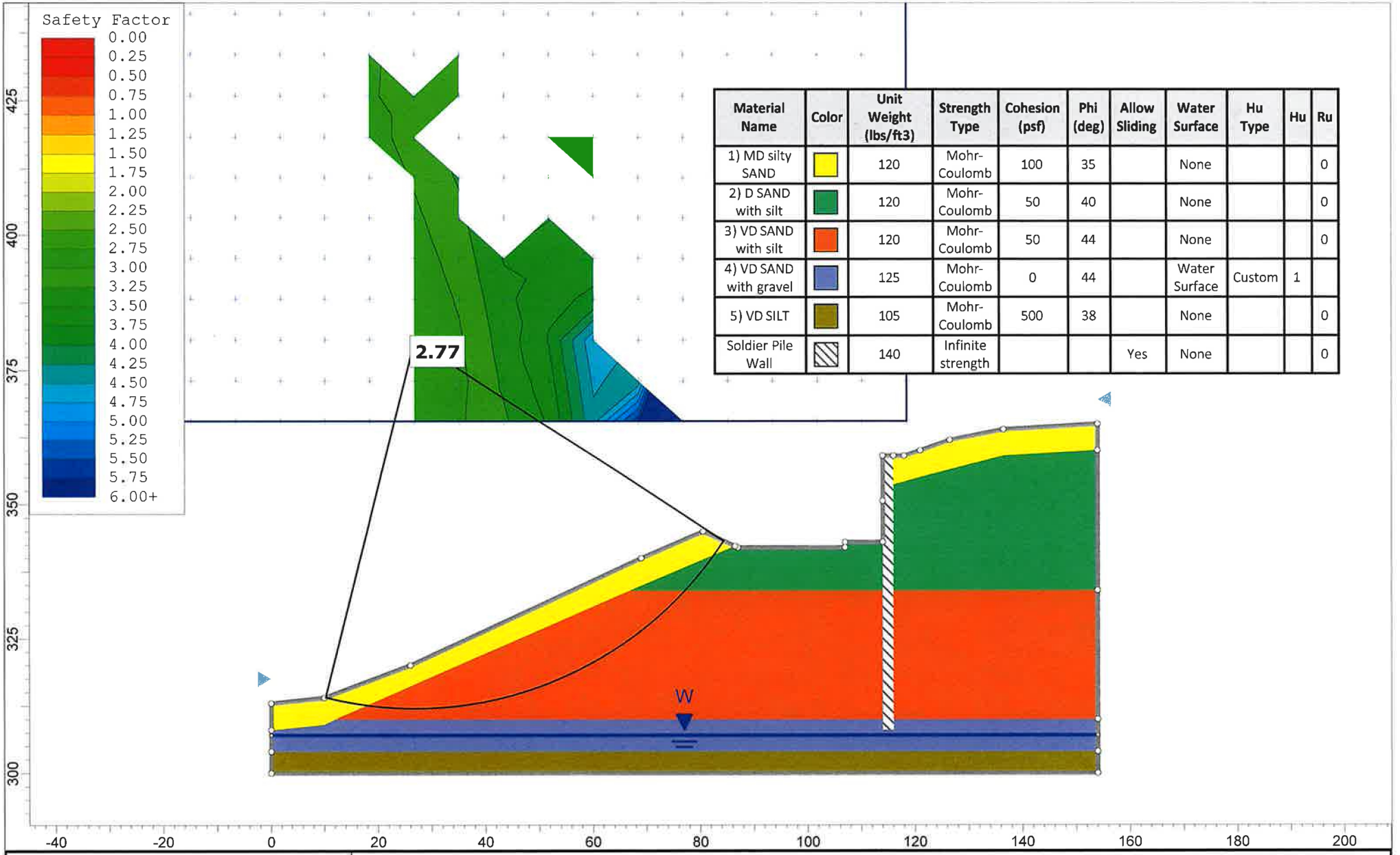
SLIDEINTERPRET 9.009

Project	Wu Property.slmd		
	B-B' Existing No Cohesion		
Drawn By	JCS	Company	Terra Associates, Inc.
Date	12/13/2023	File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35		None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40		None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44		None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44		Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38		None			0
Soldier Pile Wall		140	Infinite strength			Yes	None			0

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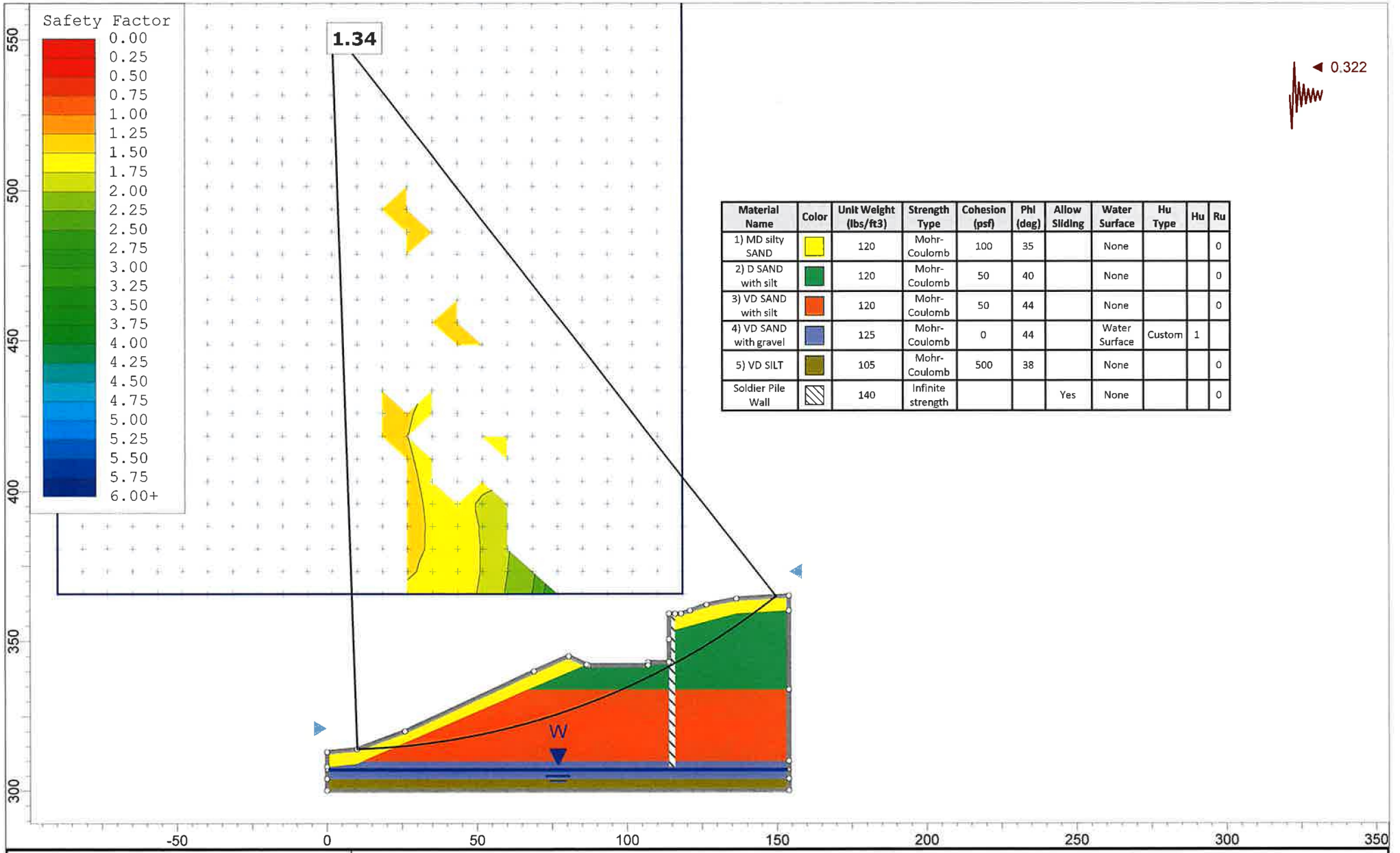
SLIDEINTERPRET 9.009

Project	Wu Property.slmd
	B-B' Proposed Static
Drawn By	JCS
Company	Terra Associates, Inc.
Date	12/14/2023
File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding	Water Surface	Hu Type	Hu	Ru
1) MD silty SAND		120	Mohr-Coulomb	100	35		None			0
2) D SAND with silt		120	Mohr-Coulomb	50	40		None			0
3) VD SAND with silt		120	Mohr-Coulomb	50	44		None			0
4) VD SAND with gravel		125	Mohr-Coulomb	0	44		Water Surface	Custom	1	
5) VD SILT		105	Mohr-Coulomb	500	38		None			0
Soldier Pile Wall		140	Infinite strength			Yes	None			0

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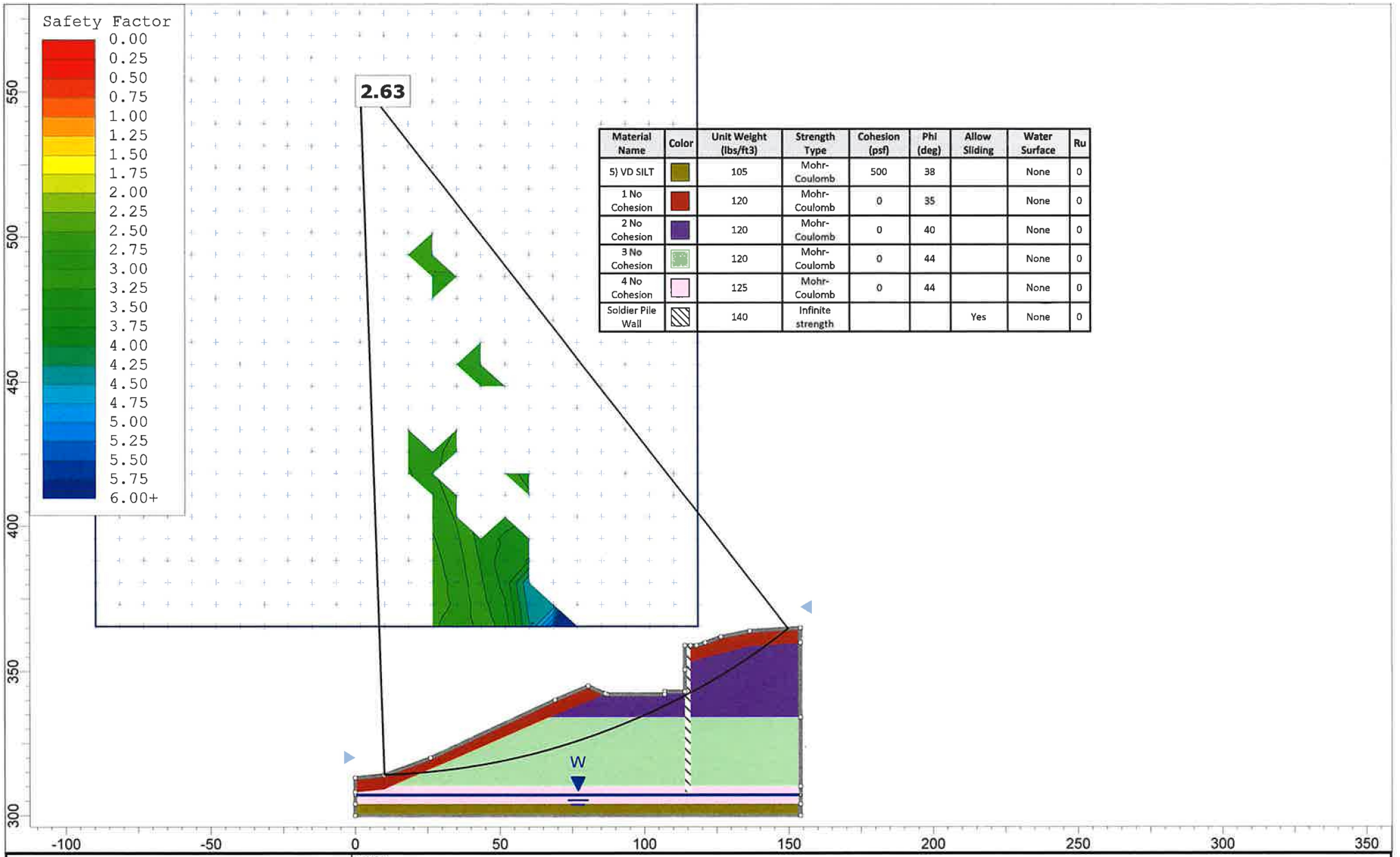
SLIDEINTERPRET 9.009

Project	Wu Property.slmd		
	B-B' Proposed Pseudostatic		
Drawn By	JCS	Company	Terra Associates, Inc.
Date	12/14/2023	File Name	Wu Property.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding	Water Surface	Ru
5) VD SILT		105	Mohr-Coulomb	500	38		None	0
1 No Cohesion		120	Mohr-Coulomb	0	35		None	0
2 No Cohesion		120	Mohr-Coulomb	0	40		None	0
3 No Cohesion		120	Mohr-Coulomb	0	44		None	0
4 No Cohesion		125	Mohr-Coulomb	0	44		None	0
Soldier Pile Wall		140	Infinite strength			Yes	None	0

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SLIDEINTERPRET 9.009

Project	Wu Property.slmd		
	B-B' Proposed No Cohesion		
Drawn By	JCS	Company	Terra Associates, Inc.
Date	12/14/2023	File Name	Wu Property.slmd

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Wu Property
SLIDE - An Interactive Slope Stability Program
Date Created: 12/11/2023, 4:00:36 PM
Software Version: 9.009

Table of Contents

Slide Analysis Information

Wu Property

Project Summary

File Name:	Wu Property.slmd
Slide Modeler Version:	9.009
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	12/11/2023, 4:00:36 PM

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
A-A" Existing	Master Scenario	Bishop Simplified: 1.907180	00h:00m:00.186s
	Static	Bishop Simplified: 1.907180	00h:00m:00.237s
	Pseudostatic	Bishop Simplified: 1.045240	00h:00m:00.161s
	No Cohesion	Bishop Simplified: 1.733950	00h:00m:00.161s
A-A' Proposed	Master Scenario	Bishop Simplified: 2.390560	00h:00m:00.166s
	Static	Bishop Simplified: 2.390560	00h:00m:00.168s
	Pseudostatic	Bishop Simplified: 1.158440	00h:00m:00.165s
	No Cohesion	Bishop Simplified: 2.125320	00h:00m:00.173s
B-B' Existing	Master Scenario	Bishop Simplified: 2.502860	00h:00m:00.134s
	Static	Bishop Simplified: 2.502860	00h:00m:00.133s
	Pseudostatic	Bishop Simplified: 1.271520	00h:00m:00.147s
	No Cohesion	Bishop Simplified: 2.343560	00h:00m:00.135s
B-B' Proposed	Master Scenario	Bishop Simplified: 2.773850	00h:00m:00.151s
	Static	Bishop Simplified: 2.773850	00h:00m:00.148s
	Pseudostatic	Bishop Simplified: 1.341440	00h:00m:00.188s
	No Cohesion	Bishop Simplified: 2.626570	00h:00m:00.141s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

A-A" Existing

Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation [ft]:	291
Minimum Depth [ft]:	15
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

A-A' Proposed

Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation [ft]:	291
Minimum Depth [ft]:	15
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

B-B' Existing

Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation [ft]:	301
Minimum Depth [ft]:	15
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

B-B' Proposed

Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation [ft]:	301
Minimum Depth [ft]:	15
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

A-A" Existing - Master Scenario

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

A-A" Existing - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

A-A" Existing - Pseudostatic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.322

A-A" Existing - No Cohesion

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

A-A' Proposed - Master Scenario

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

A-A' Proposed - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

A-A' Proposed - Pseudostatic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.322

A-A' Proposed - No Cohesion

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

B-B' Existing - Master Scenario

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

B-B' Existing - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

B-B' Existing - Pseudostatic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.322

B-B' Existing - No Cohesion

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

B-B' Proposed - Master Scenario

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

B-B' Proposed - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

B-B' Proposed - Pseudostatic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.322

B-B' Proposed - No Cohesion

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

1) MD silty SAND	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	100
Friction Angle [deg]	35
Water Surface	Assigned per scenario
Ru Value	0
2) D SAND with silt	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	50
Friction Angle [deg]	40
Water Surface	Assigned per scenario
Ru Value	0
3) VD SAND with silt	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	50
Friction Angle [deg]	44
Water Surface	Assigned per scenario
Ru Value	0
4) VD SAND with gravel	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	0
Friction Angle [deg]	44
Water Surface	Assigned per scenario
Hu Value	1
5) VD SILT	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	105
Cohesion [psf]	500
Friction Angle [deg]	38
Water Surface	Assigned per scenario
Ru Value	0
1 No Cohesion	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0

Friction Angle [deg]	35
Water Surface	Assigned per scenario
Ru Value	0
2 No Cohesion	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	40
Water Surface	Assigned per scenario
Ru Value	0
3 No Cohesion	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	0
Friction Angle [deg]	44
Water Surface	Assigned per scenario
Ru Value	0
4 No Cohesion	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	0
Friction Angle [deg]	44
Water Surface	Assigned per scenario
Hu Value	1
MSE Wall	
Color	
Strength Type	Infinite strength
Unit Weight [lbs/ft3]	140
Allow Sliding Along Boundary	No
Water Surface	Assigned per scenario
Ru Value	0
6) Structural Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	0
Friction Angle [deg]	38
Water Surface	Assigned per scenario
Hu Value	1
Soldier Pile Wall	
Color	
Strength Type	Infinite strength
Unit Weight [lbs/ft3]	140
Allow Sliding Along Boundary	Yes
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	A-A" Existing	Static	Pseudostatic	No Cohesion	A-A' Proposed	Static	Pseudostatic	No Cohesion	B-B' Existing	Static	Pseudostatic	No Cohesion	B-B' Proposed	Static	Pseudostatic	No Cohesion
1) MD SAND	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗
2) D S silt	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗
3) VD with s	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗
4) VD with g	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗
5) VD	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1 No C	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓
2 No C	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓
3 No C	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓
4 No C	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓
MSE W	✗	✗	✗	✗	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
6) Stru Fill	✗	✗	✗	✗	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
Soldier Wall	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓

Global Minimums

A-A" Existing - Master Scenario

Method: bishop simplified

FS	1.907180
Center:	125.614, 421.230
Radius:	81.729
Left Slip Surface Endpoint:	119.614, 339.722
Right Slip Surface Endpoint:	191.954, 373.495
Resisting Moment:	5.37884e+06 lb-ft
Driving Moment:	2.8203e+06 lb-ft
Total Slice Area:	662.422 ft2
Surface Horizontal Width:	72.3398 ft
Surface Average Height:	9.1571 ft

A-A" Existing - Static

Method: bishop simplified

FS	1.907180
Center:	125.614, 421.230
Radius:	81.729
Left Slip Surface Endpoint:	119.614, 339.722
Right Slip Surface Endpoint:	191.954, 373.495
Resisting Moment:	5.37884e+06 lb-ft
Driving Moment:	2.8203e+06 lb-ft
Total Slice Area:	662.422 ft2
Surface Horizontal Width:	72.3398 ft
Surface Average Height:	9.1571 ft

A-A" Existing - Pseudostatic

Method: bishop simplified

FS	1.045240
Center:	98.102, 494.596
Radius:	158.654
Left Slip Surface Endpoint:	111.264, 336.489
Right Slip Surface Endpoint:	201.836, 374.554
Resisting Moment:	1.00509e+07 lb-ft
Driving Moment:	9.61589e+06 lb-ft
Total Slice Area:	730.118 ft2
Surface Horizontal Width:	90.5727 ft
Surface Average Height:	8.06112 ft

A-A" Existing - No Cohesion

Method: bishop simplified

FS	1.733950
Center:	130.200, 416.644
Radius:	75.443
Left Slip Surface Endpoint:	124.079, 341.450
Right Slip Surface Endpoint:	192.096, 373.510
Resisting Moment:	4.25942e+06 lb-ft
Driving Moment:	2.45648e+06 lb-ft
Total Slice Area:	625.67 ft2
Surface Horizontal Width:	68.0167 ft
Surface Average Height:	9.19877 ft

A-A' Proposed - Master Scenario

Method: bishop simplified

FS	2.390560
Center:	75.175, 412.059
Radius:	86.522
Left Slip Surface Endpoint:	63.673, 326.304
Right Slip Surface Endpoint:	137.457, 352.000
Resisting Moment:	5.80626e+06 lb-ft
Driving Moment:	2.42883e+06 lb-ft
Total Slice Area:	660.983 ft2
Surface Horizontal Width:	73.7838 ft
Surface Average Height:	8.95838 ft

A-A' Proposed - Static

Method: bishop simplified

FS	2.390560
Center:	75.175, 412.059
Radius:	86.522
Left Slip Surface Endpoint:	63.673, 326.304
Right Slip Surface Endpoint:	137.457, 352.000
Resisting Moment:	5.80626e+06 lb-ft
Driving Moment:	2.42883e+06 lb-ft
Total Slice Area:	660.983 ft2
Surface Horizontal Width:	73.7838 ft
Surface Average Height:	8.95838 ft

A-A' Proposed - Pseudostatic

Method: bishop simplified

FS	1.158440
Center:	70.589, 444.157
Radius:	118.365
Left Slip Surface Endpoint:	62.411, 326.075
Right Slip Surface Endpoint:	144.868, 352.000
Resisting Moment:	7.52687e+06 lb-ft
Driving Moment:	6.49743e+06 lb-ft
Total Slice Area:	732.614 ft2
Surface Horizontal Width:	82.4576 ft
Surface Average Height:	8.88474 ft

A-A' Proposed - No Cohesion

Method: bishop simplified

FS	2.125320
Center:	61.418, 503.767
Radius:	178.839
Left Slip Surface Endpoint:	54.494, 325.062
Right Slip Surface Endpoint:	179.440, 369.400
Resisting Moment:	1.5386e+07 lb-ft
Driving Moment:	7.23938e+06 lb-ft
Total Slice Area:	1037.26 ft2
Surface Horizontal Width:	124.946 ft
Surface Average Height:	8.30166 ft

B-B' Existing - Master Scenario

Method: bishop simplified

FS	2.502860
Center:	14.310, 466.340
Radius:	151.719
Left Slip Surface Endpoint:	11.715, 314.643
Right Slip Surface Endpoint:	123.363, 360.859
Resisting Moment:	1.87011e+07 lb-ft
Driving Moment:	7.47189e+06 lb-ft
Total Slice Area:	1104.53 ft2
Surface Horizontal Width:	111.648 ft
Surface Average Height:	9.8929 ft

B-B' Existing - Static

Method: bishop simplified

FS	2.502860
Center:	14.310, 466.340
Radius:	151.719
Left Slip Surface Endpoint:	11.715, 314.643
Right Slip Surface Endpoint:	123.363, 360.859
Resisting Moment:	1.87011e+07 lb-ft
Driving Moment:	7.47189e+06 lb-ft
Total Slice Area:	1104.53 ft2
Surface Horizontal Width:	111.648 ft
Surface Average Height:	9.8929 ft

B-B' Existing - Pseudostatic

Method: bishop simplified

FS	1.271520
Center:	14.310, 475.049
Radius:	160.302
Left Slip Surface Endpoint:	12.036, 314.763
Right Slip Surface Endpoint:	128.323, 362.365
Resisting Moment:	1.90876e+07 lb-ft
Driving Moment:	1.50116e+07 lb-ft
Total Slice Area:	1199.82 ft2
Surface Horizontal Width:	116.288 ft
Surface Average Height:	10.3177 ft

B-B' Existing - No Cohesion

Method: bishop simplified

FS	2.343560
Center:	9.956, 470.695
Radius:	157.279
Left Slip Surface Endpoint:	4.954, 313.495
Right Slip Surface Endpoint:	122.068, 360.388
Resisting Moment:	1.82804e+07 lb-ft
Driving Moment:	7.80028e+06 lb-ft
Total Slice Area:	1108.81 ft2
Surface Horizontal Width:	117.114 ft
Surface Average Height:	9.46778 ft

B-B' Proposed - Master Scenario

Method: bishop simplified

FS	2.773850
Center:	26.859, 380.596
Radius:	68.561
Left Slip Surface Endpoint:	10.224, 314.084
Right Slip Surface Endpoint:	84.341, 343.227
Resisting Moment:	6.33417e+06 lb-ft
Driving Moment:	2.28353e+06 lb-ft
Total Slice Area:	783.448 ft2
Surface Horizontal Width:	74.1174 ft
Surface Average Height:	10.5704 ft

B-B' Proposed - Static

Method: bishop simplified

FS	2.773850
Center:	26.859, 380.596
Radius:	68.561
Left Slip Surface Endpoint:	10.224, 314.084
Right Slip Surface Endpoint:	84.341, 343.227
Resisting Moment:	6.33417e+06 lb-ft
Driving Moment:	2.28353e+06 lb-ft
Total Slice Area:	783.448 ft2
Surface Horizontal Width:	74.1174 ft
Surface Average Height:	10.5704 ft

B-B' Proposed - Pseudostatic

Method: bishop simplified

FS	1.341440
Center:	1.872, 554.208
Radius:	240.329
Left Slip Surface Endpoint:	10.047, 314.018
Right Slip Surface Endpoint:	149.745, 364.757
Resisting Moment:	3.34478e+07 lb-ft
Driving Moment:	2.49342e+07 lb-ft
Total Slice Area:	1376.58 ft2
Surface Horizontal Width:	139.697 ft
Surface Average Height:	9.854 ft

B-B' Proposed - No Cohesion

Method: bishop simplified

FS	2.626570
Center:	1.872, 554.208
Radius:	240.329
Left Slip Surface Endpoint:	10.047, 314.018
Right Slip Surface Endpoint:	149.745, 364.757
Resisting Moment:	3.49844e+07 lb-ft
Driving Moment:	1.33194e+07 lb-ft
Total Slice Area:	1376.58 ft2
Surface Horizontal Width:	139.697 ft
Surface Average Height:	9.854 ft

Global Minimum Support Data

All Open Scenarios

No Supports Present

Valid and Invalid Surfaces

A-A" Existing - Master Scenario

Method: bishop simplified

Number of Valid Surfaces:	6810
Number of Invalid Surfaces:	7386

Error Codes

Error Code -115 reported for 7386 surfaces

A-A" Existing - Static

Method: bishop simplified

Number of Valid Surfaces:	6810
Number of Invalid Surfaces:	7386

Error Codes

Error Code -115 reported for 7386 surfaces

A-A" Existing - Pseudostatic

Method: bishop simplified

Number of Valid Surfaces:	6810
Number of Invalid Surfaces:	7386

Error Codes

Error Code -115 reported for 7386 surfaces

A-A" Existing - No Cohesion

Method: bishop simplified

Number of Valid Surfaces:	6810
Number of Invalid Surfaces:	7386

Error Codes

Error Code -115 reported for 7386 surfaces

A-A' Proposed

Method: bishop simplified

Number of Valid Surfaces:	6362
Number of Invalid Surfaces:	7834

Error Codes

Error Code -99 reported for 3918 surfaces
Error Code -106 reported for 33 surfaces
Error Code -115 reported for 3883 surfaces

B-B' Existing

Method: bishop simplified

Number of Valid Surfaces:	2996
Number of Invalid Surfaces:	11200

Error Codes

Error Code -102 reported for 21 surfaces
Error Code -115 reported for 10108 surfaces
Error Code -1000 reported for 1071 surfaces

B-B' Proposed - Master Scenario

Method: bishop simplified

Number of Valid Surfaces:	212
Number of Invalid Surfaces:	22174

Error Codes

Error Code -106 reported for 161 surfaces
Error Code -109 reported for 1154 surfaces
Error Code -112 reported for 2 surfaces
Error Code -115 reported for 16090 surfaces
Error Code -1000 reported for 4767 surfaces

B-B' Proposed - Static

Method: bishop simplified

Number of Valid Surfaces:	212
Number of Invalid Surfaces:	22174

Error Codes

Error Code -106 reported for 161 surfaces
Error Code -109 reported for 1154 surfaces
Error Code -112 reported for 2 surfaces
Error Code -115 reported for 16090 surfaces
Error Code -1000 reported for 4767 surfaces

B-B' Proposed - Pseudostatic

Method: bishop simplified

Number of Valid Surfaces:	213
Number of Invalid Surfaces:	22173

Error Codes

Error Code -106 reported for 161 surfaces
Error Code -109 reported for 1154 surfaces
Error Code -115 reported for 16091 surfaces
Error Code -1000 reported for 4767 surfaces

B-B' Proposed - No Cohesion

Method: bishop simplified

Number of Valid Surfaces:	212
Number of Invalid Surfaces:	22174

Error Codes

Error Code -106 reported for 161 surfaces
Error Code -109 reported for 1154 surfaces
Error Code -112 reported for 2 surfaces
Error Code -115 reported for 16090 surfaces
Error Code -1000 reported for 4767 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-99 = Slip surface intersects an infinite strength material. If infinite strength regions are defined for a model, a large number of potential slip surfaces may show this error code. This is Normal.

-102 = Two surface / slope intersections, but resulting arc is actually outside soil region.

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-115 = Surface too shallow, below the minimum depth.

-1000 = No valid slip surface is generated

Slice Data

A-A" Existing - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 1.90718

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.39769	52.9916	-3.71911	1) MD silty SAND	100	35	67.9754	129.641	42.3321	0	42.3321	37.9136	37.9136
2	1.39769	156.961	-2.73765	1) MD silty SAND	100	35	95.3373	181.825	116.859	0	116.859	112.3	112.3
3	1.39769	256.906	-1.757	1) MD silty SAND	100	35	121.283	231.308	187.528	0	187.528	183.807	183.807
4	1.39769	352.836	-0.776857	1) MD silty SAND	100	35	145.842	278.146	254.42	0	254.42	252.442	252.442
5	1.39769	444.755	0.203054	1) MD silty SAND	100	35	169.041	322.391	317.607	0	317.607	318.207	318.207
6	1.39769	532.664	1.18302	1) MD silty SAND	100	35	190.905	364.091	377.161	0	377.161	381.103	381.103
7	1.39769	616.561	2.16334	1) MD silty SAND	100	35	211.458	403.288	433.14	0	433.14	441.128	441.128
8	1.39769	696.44	3.14429	1) MD silty SAND	100	35	230.72	440.024	485.604	0	485.604	498.278	498.278
9	1.39769	772.29	4.12617	1) MD silty SAND	100	35	248.71	474.335	534.605	0	534.605	552.547	552.547
10	1.39769	844.099	5.10926	1) MD silty SAND	100	35	265.446	506.254	580.19	0	580.19	603.924	603.924
11	1.39769	911.851	6.09386	1) MD silty SAND	100	35	280.945	535.812	622.405	0	622.405	652.398	652.398
12	1.39769	975.524	7.08027	1) MD silty SAND	100	35	295.22	563.037	661.286	0	661.286	697.954	697.954
13	1.4597	1082.3	8.09078	2) D SAND with silt	50	40	331.688	632.588	694.302	0	694.302	741.453	741.453
14	1.4597	1142.56	9.12582	2) D SAND with silt	50	40	346.135	660.141	727.139	0	727.139	782.74	782.74
15	1.4597	1198.08	10.1639	2) D SAND with silt	50	40	359.014	684.704	756.414	0	756.414	820.777	820.777
16	1.4597	1275.87	11.2053	2) D SAND with silt	50	40	377.845	720.619	799.212	0	799.212	874.064	874.064
17	1.4597	1397.58	12.2505	2) D SAND with silt	50	40	408.443	778.975	868.756	0	868.756	957.441	957.441
18	1.4597	1515.38	13.2999	2) D SAND with silt	50	40	437.472	834.337	934.739	0	934.739	1038.15	1038.15
19	1.4597	1628.23	14.3538	2) D SAND with silt	50	40	464.669	886.207	996.553	0	996.553	1115.46	1115.46
20	1.4597	1736.06	15.4127	2) D SAND with silt	50	40	490.045	934.604	1054.23	0	1054.23	1189.33	1189.33

21	1.4597	1838.78	16.477	2) D SAND with silt	50	40	513.61	979.546	1107.79	0	1107.79	1259.7	1259.7
22	1.4597	1936.33	17.5473	2) D SAND with silt	50	40	535.368	1021.04	1157.25	0	1157.25	1326.53	1326.53
23	1.4597	2028.61	18.6238	2) D SAND with silt	50	40	555.323	1059.1	1202.6	0	1202.6	1389.75	1389.75
24	1.4597	2115.52	19.7073	2) D SAND with silt	50	40	573.48	1093.73	1243.87	0	1243.87	1449.29	1449.29
25	1.4597	2196.95	20.7981	2) D SAND with silt	50	40	589.834	1124.92	1281.04	0	1281.04	1505.07	1505.07
26	1.4597	2272.79	21.8969	2) D SAND with silt	50	40	604.384	1152.67	1314.11	0	1314.11	1557.03	1557.03
27	1.4597	2342.91	23.0042	2) D SAND with silt	50	40	617.121	1176.96	1343.06	0	1343.06	1605.07	1605.07
28	1.4597	2407.18	24.1207	2) D SAND with silt	50	40	628.042	1197.79	1367.89	0	1367.89	1649.1	1649.1
29	1.4597	2465.43	25.247	2) D SAND with silt	50	40	637.134	1215.13	1388.55	0	1388.55	1689.01	1689.01
30	1.4597	2517.51	26.3839	2) D SAND with silt	50	40	644.386	1228.96	1405.04	0	1405.04	1724.69	1724.69
31	1.4597	2563.24	27.5321	2) D SAND with silt	50	40	649.781	1239.25	1417.29	0	1417.29	1756.01	1756.01
32	1.4597	2602.41	28.6924	2) D SAND with silt	50	40	653.3	1245.96	1425.29	0	1425.29	1782.84	1782.84
33	1.4597	2634.81	29.8657	2) D SAND with silt	50	40	654.92	1249.05	1428.97	0	1428.97	1805.04	1805.04
34	1.4597	2660.21	31.053	2) D SAND with silt	50	40	654.616	1248.47	1428.29	0	1428.29	1822.44	1822.44
35	1.4597	2678.34	32.2553	2) D SAND with silt	50	40	652.366	1244.18	1423.17	0	1423.17	1834.86	1834.86
36	1.4597	2688.91	33.4738	2) D SAND with silt	50	40	648.13	1236.1	1413.55	0	1413.55	1842.11	1842.11
37	1.4597	2691.61	34.7096	2) D SAND with silt	50	40	641.88	1224.18	1399.34	0	1399.34	1843.95	1843.95
38	1.4597	2655.16	35.9642	2) D SAND with silt	50	40	626.511	1194.87	1364.4	0	1364.4	1818.99	1818.99
39	1.4597	2567.75	37.2391	2) D SAND with silt	50	40	599.634	1143.61	1303.31	0	1303.31	1759.1	1759.1
40	1.4597	2471.03	38.5359	2) D SAND with silt	50	40	570.948	1088.9	1238.11	0	1238.11	1692.85	1692.85
41	1.4597	2355.7	39.8566	2) D SAND with silt	50	40	538.471	1026.96	1164.3	0	1164.3	1613.84	1613.84
42	1.4597	2174.11	41.2032	2) D SAND with silt	50	40	491.999	938.33	1058.67	0	1058.67	1489.43	1489.43
43	1.47207	1987.91	42.5841	1) MD silty SAND	100	35	409.918	781.788	973.697	0	973.697	1350.43	1350.43
44	1.47207	1770.71	44.0023	1) MD silty SAND	100	35	364.735	695.616	850.63	0	850.63	1202.88	1202.88
45	1.47207	1540.9	45.4553	1) MD silty SAND	100	35	318.09	606.655	723.577	0	723.577	1046.76	1046.76

46	1.47207	1297.49	46.9468	1) MD silty SAND	100	35	269.952	514.847	592.465	0	592.465	881.414	881.414
47	1.47207	1039.32	48.4811	1) MD silty SAND	100	35	220.292	420.137	457.204	0	457.204	706.034	706.034
48	1.47207	765.022	50.0634	1) MD silty SAND	100	35	169.086	322.478	317.732	0	317.732	519.695	519.695
49	1.47207	472.953	51.6998	1) MD silty SAND	100	35	116.318	221.839	174.004	0	174.004	321.287	321.287
50	1.47207	161.126	53.3978	1) MD silty SAND	100	35	61.9812	118.209	26.0056	0	26.0056	109.457	109.457

A-A" Existing - Static

Global Minimum Query (bishop simplified) - Safety Factor: 1.90718

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.39769	52.9916	-3.71911	1) MD silty SAND	100	35	67.9754	129.641	42.3321	0	42.3321	37.9136	37.9136
2	1.39769	156.961	-2.73765	1) MD silty SAND	100	35	95.3373	181.825	116.859	0	116.859	112.3	112.3
3	1.39769	256.906	-1.757	1) MD silty SAND	100	35	121.283	231.308	187.528	0	187.528	183.807	183.807
4	1.39769	352.836	-0.776857	1) MD silty SAND	100	35	145.842	278.146	254.42	0	254.42	252.442	252.442
5	1.39769	444.755	0.203054	1) MD silty SAND	100	35	169.041	322.391	317.607	0	317.607	318.207	318.207
6	1.39769	532.664	1.18302	1) MD silty SAND	100	35	190.905	364.091	377.161	0	377.161	381.103	381.103
7	1.39769	616.561	2.16334	1) MD silty SAND	100	35	211.458	403.288	433.14	0	433.14	441.128	441.128
8	1.39769	696.44	3.14429	1) MD silty SAND	100	35	230.72	440.024	485.604	0	485.604	498.278	498.278
9	1.39769	772.29	4.12617	1) MD silty SAND	100	35	248.71	474.335	534.605	0	534.605	552.547	552.547
10	1.39769	844.099	5.10926	1) MD silty SAND	100	35	265.446	506.254	580.19	0	580.19	603.924	603.924
11	1.39769	911.851	6.09386	1) MD silty SAND	100	35	280.945	535.812	622.405	0	622.405	652.398	652.398
12	1.39769	975.524	7.08027	1) MD silty SAND	100	35	295.22	563.037	661.286	0	661.286	697.954	697.954
13	1.4597	1082.3	8.09078	2) D SAND with silt	50	40	331.688	632.588	694.302	0	694.302	741.453	741.453
14	1.4597	1142.56	9.12582	2) D SAND with silt	50	40	346.135	660.141	727.139	0	727.139	782.74	782.74
15	1.4597	1198.08	10.1639	2) D SAND with silt	50	40	359.014	684.704	756.414	0	756.414	820.777	820.777
16	1.4597	1275.87	11.2053	2) D SAND with silt	50	40	377.845	720.619	799.212	0	799.212	874.064	874.064
17	1.4597	1397.58	12.2505	2) D SAND with silt	50	40	408.443	778.975	868.756	0	868.756	957.441	957.441
18	1.4597	1515.38	13.2999	2) D SAND with silt	50	40	437.472	834.337	934.739	0	934.739	1038.15	1038.15
19	1.4597	1628.23	14.3538	2) D SAND with silt	50	40	464.669	886.207	996.553	0	996.553	1115.46	1115.46
20	1.4597	1736.06	15.4127	2) D SAND with silt	50	40	490.045	934.604	1054.23	0	1054.23	1189.33	1189.33
21	1.4597	1838.78	16.477	2) D SAND with silt	50	40	513.61	979.546	1107.79	0	1107.79	1259.7	1259.7
22	1.4597	1936.33	17.5473	2) D SAND with silt	50	40	535.368	1021.04	1157.25	0	1157.25	1326.53	1326.53

23	1.4597	2028.61	18.6238	2) D SAND with silt	50	40	555.323	1059.1	1202.6	0	1202.6	1389.75	1389.75
24	1.4597	2115.52	19.7073	2) D SAND with silt	50	40	573.48	1093.73	1243.87	0	1243.87	1449.29	1449.29
25	1.4597	2196.95	20.7981	2) D SAND with silt	50	40	589.834	1124.92	1281.04	0	1281.04	1505.07	1505.07
26	1.4597	2272.79	21.8969	2) D SAND with silt	50	40	604.384	1152.67	1314.11	0	1314.11	1557.03	1557.03
27	1.4597	2342.91	23.0042	2) D SAND with silt	50	40	617.121	1176.96	1343.06	0	1343.06	1605.07	1605.07
28	1.4597	2407.18	24.1207	2) D SAND with silt	50	40	628.042	1197.79	1367.89	0	1367.89	1649.1	1649.1
29	1.4597	2465.43	25.247	2) D SAND with silt	50	40	637.134	1215.13	1388.55	0	1388.55	1689.01	1689.01
30	1.4597	2517.51	26.3839	2) D SAND with silt	50	40	644.386	1228.96	1405.04	0	1405.04	1724.69	1724.69
31	1.4597	2563.24	27.5321	2) D SAND with silt	50	40	649.781	1239.25	1417.29	0	1417.29	1756.01	1756.01
32	1.4597	2602.41	28.6924	2) D SAND with silt	50	40	653.3	1245.96	1425.29	0	1425.29	1782.84	1782.84
33	1.4597	2634.81	29.8657	2) D SAND with silt	50	40	654.92	1249.05	1428.97	0	1428.97	1805.04	1805.04
34	1.4597	2660.21	31.053	2) D SAND with silt	50	40	654.616	1248.47	1428.29	0	1428.29	1822.44	1822.44
35	1.4597	2678.34	32.2553	2) D SAND with silt	50	40	652.366	1244.18	1423.17	0	1423.17	1834.86	1834.86
36	1.4597	2688.91	33.4738	2) D SAND with silt	50	40	648.13	1236.1	1413.55	0	1413.55	1842.11	1842.11
37	1.4597	2691.61	34.7096	2) D SAND with silt	50	40	641.88	1224.18	1399.34	0	1399.34	1843.95	1843.95
38	1.4597	2655.16	35.9642	2) D SAND with silt	50	40	626.511	1194.87	1364.4	0	1364.4	1818.99	1818.99
39	1.4597	2567.75	37.2391	2) D SAND with silt	50	40	599.634	1143.61	1303.31	0	1303.31	1759.1	1759.1
40	1.4597	2471.03	38.5359	2) D SAND with silt	50	40	570.948	1088.9	1238.11	0	1238.11	1692.85	1692.85
41	1.4597	2355.7	39.8566	2) D SAND with silt	50	40	538.471	1026.96	1164.3	0	1164.3	1613.84	1613.84
42	1.4597	2174.11	41.2032	2) D SAND with silt	50	40	491.999	938.33	1058.67	0	1058.67	1489.43	1489.43
43	1.47207	1987.91	42.5841	1) MD silty SAND	100	35	409.918	781.788	973.697	0	973.697	1350.43	1350.43
44	1.47207	1770.71	44.0023	1) MD silty SAND	100	35	364.735	695.616	850.63	0	850.63	1202.88	1202.88
45	1.47207	1540.9	45.4553	1) MD silty SAND	100	35	318.09	606.655	723.577	0	723.577	1046.76	1046.76
46	1.47207	1297.49	46.9468	1) MD silty SAND	100	35	269.952	514.847	592.465	0	592.465	881.414	881.414
47	1.47207	1039.32	48.4811	1) MD silty SAND	100	35	220.292	420.137	457.204	0	457.204	706.034	706.034

48	1.47207	765.022	50.0634	1) MD silty SAND	100	35	169.086	322.478	317.732	0	317.732	519.695	519.695
49	1.47207	472.953	51.6998	1) MD silty SAND	100	35	116.318	221.839	174.004	0	174.004	321.287	321.287
50	1.47207	161.126	53.3978	1) MD silty SAND	100	35	61.9812	118.209	26.0056	0	26.0056	109.457	109.457

A-A" Existing - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.04524

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.77513	56.3773	5.08058	1) MD silty SAND	100	35	110.374	115.368	21.9476	0	21.9476	31.7605	31.7605
2	1.77513	166.988	5.72452	1) MD silty SAND	100	35	148.705	155.432	79.1654	0	79.1654	94.0724	94.0724
3	1.77513	273.304	6.36919	1) MD silty SAND	100	35	184.981	193.349	133.317	0	133.317	153.965	153.965
4	1.77513	375.309	7.01466	1) MD silty SAND	100	35	219.237	229.155	184.453	0	184.453	211.429	211.429
5	1.77513	472.987	7.66103	1) MD silty SAND	100	35	251.507	262.885	232.624	0	232.624	266.455	266.455
6	1.77513	566.318	8.30839	1) MD silty SAND	100	35	281.822	294.572	277.878	0	277.878	319.033	319.033
7	1.77513	655.282	8.95681	1) MD silty SAND	100	35	310.213	324.247	320.258	0	320.258	369.151	369.151
8	1.77513	739.856	9.60639	1) MD silty SAND	100	35	336.707	351.94	359.808	0	359.808	416.796	416.796
9	1.77513	820.016	10.2572	1) MD silty SAND	100	35	361.332	377.679	396.567	0	396.567	461.954	461.954
10	1.77513	895.735	10.9094	1) MD silty SAND	100	35	384.116	401.493	430.576	0	430.576	504.611	504.611
11	1.77513	966.986	11.563	1) MD silty SAND	100	35	405.079	423.405	461.871	0	461.871	544.749	544.749
12	1.77513	1033.74	12.2181	1) MD silty SAND	100	35	424.25	443.443	490.487	0	490.487	582.353	582.353
13	1.77513	1095.95	12.8749	1) MD silty SAND	100	35	441.647	461.627	516.457	0	516.457	617.404	617.404
14	1.77513	1153.61	13.5334	1) MD silty SAND	100	35	457.294	477.982	539.814	0	539.814	649.882	649.882
15	1.77513	1206.65	14.1937	1) MD silty SAND	100	35	471.209	492.527	560.588	0	560.588	679.767	679.767
16	1.77513	1255.06	14.856	1) MD silty SAND	100	35	483.414	505.284	578.808	0	578.808	707.037	707.037
17	1.81524	1332.74	15.5278	2) D SAND with silt	50	40	521.031	544.602	589.443	0	589.443	734.209	734.209
18	1.81524	1460.09	16.2093	2) D SAND with silt	50	40	562.336	587.776	640.897	0	640.897	804.37	804.37
19	1.81524	1614.42	16.8932	2) D SAND with silt	50	40	612.496	640.205	703.379	0	703.379	889.39	889.39
20	1.81524	1763.59	17.5796	2) D SAND with silt	50	40	659.94	689.796	762.482	0	762.482	971.569	971.569
21	1.81524	1907.53	18.2686	2) D SAND with silt	50	40	704.7	736.581	818.238	0	818.238	1050.87	1050.87
22	1.81524	2046.18	18.9604	2) D SAND with silt	50	40	746.806	780.591	870.685	0	870.685	1127.25	1127.25

23	1.81524	2179.49	19.655	2) D SAND with silt	50	40	786.283	821.854	919.86	0	919.86	1200.69	1200.69
24	1.81524	2307.38	20.3527	2) D SAND with silt	50	40	823.158	860.398	965.794	0	965.794	1271.15	1271.15
25	1.81524	2429.78	21.0535	2) D SAND with silt	50	40	857.455	896.246	1008.51	0	1008.51	1338.58	1338.58
26	1.81524	2546.62	21.7576	2) D SAND with silt	50	40	889.197	929.424	1048.06	0	1048.06	1402.95	1402.95
27	1.81524	2657.8	22.4652	2) D SAND with silt	50	40	918.403	959.952	1084.44	0	1084.44	1464.2	1464.2
28	1.81524	2763.26	23.1765	2) D SAND with silt	50	40	945.095	987.851	1117.68	0	1117.68	1522.29	1522.29
29	1.81524	2862.88	23.8915	2) D SAND with silt	50	40	969.288	1013.14	1147.83	0	1147.83	1577.18	1577.18
30	1.81524	2956.59	24.6105	2) D SAND with silt	50	40	991.001	1035.83	1174.87	0	1174.87	1628.81	1628.81
31	1.81524	3044.28	25.3337	2) D SAND with silt	50	40	1010.25	1055.95	1198.85	0	1198.85	1677.12	1677.12
32	1.81524	3125.84	26.0612	2) D SAND with silt	50	40	1027.05	1073.51	1219.77	0	1219.77	1722.05	1722.05
33	1.81524	3201.15	26.7933	2) D SAND with silt	50	40	1041.4	1088.51	1237.65	0	1237.65	1763.54	1763.54
34	1.81524	3270.11	27.5301	2) D SAND with silt	50	40	1053.32	1100.97	1252.5	0	1252.5	1801.53	1801.53
35	1.81524	3309.55	28.272	2) D SAND with silt	50	40	1055.72	1103.48	1255.48	0	1255.48	1823.26	1823.26
36	1.81524	3259.23	29.019	2) D SAND with silt	50	40	1030.39	1077.01	1223.93	0	1223.93	1795.54	1795.54
37	1.81524	3194.62	29.7714	2) D SAND with silt	50	40	1001	1046.29	1187.33	0	1187.33	1759.95	1759.95
38	1.81524	3078.06	30.5296	2) D SAND with silt	50	40	956.364	999.63	1131.72	0	1131.72	1695.73	1695.73
39	1.81524	2884.46	31.2937	2) D SAND with silt	50	40	889.474	929.714	1048.4	0	1048.4	1589.08	1589.08
40	1.81524	2682.8	32.064	2) D SAND with silt	50	40	821.311	858.467	963.495	0	963.495	1477.98	1477.98
41	1.86051	2532.63	32.8507	1) MD silty SAND	100	35	703.361	735.181	907.133	0	907.133	1361.3	1361.3
42	1.86051	2304.75	33.6542	1) MD silty SAND	100	35	640.084	669.041	812.673	0	812.673	1238.82	1238.82
43	1.86051	2068.43	34.4653	1) MD silty SAND	100	35	575.734	601.78	716.615	0	716.615	1111.79	1111.79
44	1.86051	1823.41	35.2843	1) MD silty SAND	100	35	510.325	533.412	618.979	0	618.979	980.099	980.099
45	1.86051	1569.44	36.1117	1) MD silty SAND	100	35	443.867	463.948	519.77	0	519.77	843.583	843.583
46	1.86051	1306.22	36.9479	1) MD silty SAND	100	35	376.375	393.402	419.021	0	419.021	702.104	702.104
47	1.86051	1033.45	37.7934	1) MD silty SAND	100	35	307.86	321.788	316.747	0	316.747	555.491	555.491

48	1.86051	750.81	38.6487	1) MD silty SAND	100	35	238.341	249.124	212.972	0	212.972	403.569	403.569
49	1.86051	457.937	39.5144	1) MD silty SAND	100	35	167.836	175.429	107.724	0	107.724	246.148	246.148
50	1.86051	154.448	40.3909	1) MD silty SAND	100	35	96.3651	100.725	1.0349	0	1.0349	83.0217	83.0217

A-A" Existing - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 1.73395

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.40265	54.197	-4.11953	1 No Cohesion	0	35	16.0694	27.8636	39.7933	0	39.7933	38.636	38.636
2	1.40265	160.383	-3.05213	1 No Cohesion	0	35	47.1876	81.8209	116.853	0	116.853	114.337	114.337
3	1.40265	262.16	-1.98578	1 No Cohesion	0	35	76.5449	132.725	189.55	0	189.55	186.896	186.896
4	1.40265	359.539	-0.920129	1 No Cohesion	0	35	104.185	180.652	257.997	0	257.997	256.324	256.324
5	1.40265	452.525	0.145208	1 No Cohesion	0	35	130.149	225.672	322.293	0	322.293	322.623	322.623
6	1.40265	541.121	1.2106	1 No Cohesion	0	35	154.474	267.85	382.53	0	382.53	385.795	385.795
7	1.40265	625.324	2.2764	1 No Cohesion	0	35	177.194	307.245	438.792	0	438.792	445.836	445.836
8	1.40265	705.126	3.343	1 No Cohesion	0	35	198.34	343.911	491.156	0	491.156	502.741	502.741
9	1.40265	780.515	4.41075	1 No Cohesion	0	35	217.94	377.897	539.692	0	539.692	556.503	556.503
10	1.40265	851.475	5.48005	1 No Cohesion	0	35	236.02	409.247	584.465	0	584.465	607.109	607.109
11	1.40265	917.983	6.55126	1 No Cohesion	0	35	252.604	438.003	625.533	0	625.533	654.542	654.542
12	1.40265	980.014	7.62478	1 No Cohesion	0	35	267.712	464.2	662.946	0	662.946	698.784	698.784
13	1.36518	1038.47	8.68658	2 No Cohesion	0	40	342.832	594.454	708.442	0	708.442	760.821	760.821
14	1.36518	1155.8	9.73699	2 No Cohesion	0	40	378.37	656.074	781.882	0	781.882	846.809	846.809
15	1.36518	1269.06	10.7907	2 No Cohesion	0	40	411.958	714.314	851.288	0	851.288	929.804	929.804
16	1.36518	1378.04	11.8481	2 No Cohesion	0	40	443.573	769.133	916.62	0	916.62	1009.68	1009.68
17	1.36518	1482.71	12.9097	2 No Cohesion	0	40	473.236	820.567	977.916	0	977.916	1086.39	1086.39
18	1.36518	1583.01	13.9757	2 No Cohesion	0	40	500.965	868.648	1035.21	0	1035.21	1159.89	1159.89
19	1.36518	1678.87	15.0468	2 No Cohesion	0	40	526.775	913.402	1088.55	0	1088.55	1230.16	1230.16
20	1.36518	1770.24	16.1232	2 No Cohesion	0	40	550.681	954.853	1137.95	0	1137.95	1297.14	1297.14
21	1.36518	1857.05	17.2055	2 No Cohesion	0	40	572.691	993.017	1183.43	0	1183.43	1360.77	1360.77
22	1.36518	1939.21	18.2942	2 No Cohesion	0	40	592.814	1027.91	1225.02	0	1225.02	1421	1421
23	1.36518	2016.64	19.3898	2 No Cohesion	0	40	611.056	1059.54	1262.71	0	1262.71	1477.77	1477.77
24	1.36518	2089.24	20.4928	2 No Cohesion	0	40	627.417	1087.91	1296.52	0	1296.52	1531.01	1531.01
25	1.36518	2156.93	21.6038	2 No Cohesion	0	40	641.899	1113.02	1326.44	0	1326.44	1580.64	1580.64
26	1.36518	2219.57	22.7234	2 No Cohesion	0	40	654.5	1134.87	1352.48	0	1352.48	1626.58	1626.58
27	1.36518	2277.05	23.8523	2 No Cohesion	0	40	665.209	1153.44	1374.62	0	1374.62	1668.74	1668.74
28	1.36518	2329.25	24.991	2 No Cohesion	0	40	674.033	1168.74	1392.84	0	1392.84	1707.02	1707.02
29	1.36518	2376	26.1405	2 No Cohesion	0	40	680.948	1180.73	1407.13	0	1407.13	1741.32	1741.32
30	1.36518	2417.16	27.3013	2 No Cohesion	0	40	685.943	1189.39	1417.46	0	1417.46	1771.53	1771.53
31	1.36518	2452.55	28.4745	2 No Cohesion	0	40	689.011	1194.71	1423.8	0	1423.8	1797.5	1797.5
32	1.36518	2481.97	29.6608	2 No Cohesion	0	40	690.118	1196.63	1426.09	0	1426.09	1819.1	1819.1

33	1.36518	2505.22	30.8613	2 No Cohesion	0	40	689.259	1195.14	1424.31	0	1424.31	1836.19	1836.19
34	1.36518	2522.07	32.077	2 No Cohesion	0	40	686.392	1190.17	1418.39	0	1418.39	1848.58	1848.58
35	1.36518	2532.27	33.3091	2 No Cohesion	0	40	681.496	1181.68	1408.28	0	1408.28	1856.09	1856.09
36	1.36518	2527.66	34.5589	2 No Cohesion	0	40	672.453	1166	1389.58	0	1389.58	1852.76	1852.76
37	1.36518	2467.59	35.8278	2 No Cohesion	0	40	648.675	1124.77	1340.45	0	1340.45	1808.77	1808.77
38	1.36518	2391.69	37.1173	2 No Cohesion	0	40	620.987	1076.76	1283.23	0	1283.23	1753.18	1753.18
39	1.36518	2307.8	38.4292	2 No Cohesion	0	40	591.545	1025.71	1222.39	0	1222.39	1691.73	1691.73
40	1.36518	2192.83	39.7654	2 No Cohesion	0	40	554.577	961.608	1146	0	1146	1607.49	1607.49
41	1.36518	2027.02	41.128	2 No Cohesion	0	40	505.493	876.5	1044.57	0	1044.57	1485.98	1485.98
42	1.28831	1751.52	42.4796	1 No Cohesion	0	35	401.099	695.485	993.253	0	993.253	1360.53	1360.53
43	1.28831	1586.1	43.821	1 No Cohesion	0	35	358.577	621.754	887.958	0	887.958	1232.07	1232.07
44	1.28831	1411.62	45.1933	1 No Cohesion	0	35	314.823	545.887	779.605	0	779.605	1096.56	1096.56
45	1.28831	1227.39	46.5995	1 No Cohesion	0	35	269.818	467.851	668.162	0	668.162	953.482	953.482
46	1.28831	1032.66	48.0432	1 No Cohesion	0	35	223.547	387.619	553.577	0	553.577	802.227	802.227
47	1.28831	826.516	49.5287	1 No Cohesion	0	35	175.997	305.17	435.828	0	435.828	642.103	642.103
48	1.28831	607.896	51.0608	1 No Cohesion	0	35	127.164	220.496	314.901	0	314.901	472.277	472.277
49	1.28831	375.526	52.6455	1 No Cohesion	0	35	77.0535	133.607	190.81	0	190.81	291.758	291.758
50	1.28831	127.865	54.29	1 No Cohesion	0	35	25.6876	44.541	63.6112	0	63.6112	99.3461	99.3461

A-A' Proposed - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 2.39056

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.45566	39.0714	-7.15325	1) MD silty SAND	100	35	51.5865	123.321	33.3053	0	33.3053	26.8312	26.8312
2	1.45566	115.031	-6.18269	1) MD silty SAND	100	35	67.1035	160.415	86.2814	0	86.2814	79.0121	79.0121
3	1.45566	186.636	-5.21391	1) MD silty SAND	100	35	81.5626	194.98	135.646	0	135.646	128.203	128.203
4	1.45566	253.91	-4.24662	1) MD silty SAND	100	35	94.9853	227.068	181.472	0	181.472	174.419	174.419
5	1.45566	316.869	-3.28054	1) MD silty SAND	100	35	107.391	256.725	223.827	0	223.827	217.671	217.671
6	1.45566	375.528	-2.3154	1) MD silty SAND	100	35	118.799	283.997	262.774	0	262.774	257.971	257.971
7	1.45566	429.898	-1.35091	1) MD silty SAND	100	35	129.226	308.922	298.372	0	298.372	295.324	295.324
8	1.45566	479.986	-0.38681	1) MD silty SAND	100	35	138.687	331.54	330.673	0	330.673	329.737	329.737
9	1.45566	525.795	0.577183	1) MD silty SAND	100	35	147.197	351.884	359.727	0	359.727	361.21	361.21
10	1.45566	567.325	1.54134	1) MD silty SAND	100	35	154.77	369.986	385.579	0	385.579	389.744	389.744
11	1.45566	604.571	2.50593	1) MD silty SAND	100	35	161.416	385.875	408.271	0	408.271	415.335	415.335
12	1.45566	637.526	3.47124	1) MD silty SAND	100	35	167.148	399.577	427.841	0	427.841	437.98	437.98
13	1.40598	643.044	4.42102	3) VD SAND with silt	50	44	199.452	476.801	441.965	0	441.965	457.386	457.386
14	1.40598	665.885	5.35552	3) VD SAND with silt	50	44	204.501	488.873	454.466	0	454.466	473.637	473.637
15	1.40598	2376.9	6.29144	3) VD SAND with silt	50	44	673.867	1610.92	1616.38	0	1616.38	1690.67	1690.67
16	1.40598	2408.12	7.22905	3) VD SAND with silt	50	44	678.109	1621.06	1626.88	0	1626.88	1712.89	1712.89
17	1.40598	2353.34	8.16862	3) VD SAND with silt	50	44	658.917	1575.18	1579.37	0	1579.37	1673.95	1673.95
18	1.40598	2180.91	9.1104	3) VD SAND with silt	50	44	608.184	1453.9	1453.78	0	1453.78	1551.31	1551.31
19	1.40598	2190.28	10.0547	3) VD SAND with silt	50	44	606.816	1450.63	1450.4	0	1450.4	1557.99	1557.99
20	1.40598	2195.61	11.0017	3) VD SAND with silt	50	44	604.356	1444.75	1444.31	0	1444.31	1561.8	1561.8
21	1.40598	2207.67	11.9518	3) VD SAND with silt	50	44	603.67	1443.11	1442.61	0	1442.61	1570.39	1570.39
22	1.40598	2266.04	12.9052	3) VD SAND with silt	50	44	615.136	1470.52	1470.99	0	1470.99	1611.93	1611.93

23	1.49488	2475.12	13.8927	1) MD silty SAND	100	35	491.27	1174.41	1534.41	0	1534.41	1655.92	1655.92
24	1.49488	2534.45	14.9148	1) MD silty SAND	100	35	499.519	1194.13	1562.58	0	1562.58	1695.63	1695.63
25	1.49488	2587.97	15.9418	1) MD silty SAND	100	35	506.597	1211.05	1586.74	0	1586.74	1731.45	1731.45
26	1.49488	2636.27	16.9741	1) MD silty SAND	100	35	512.62	1225.45	1607.31	0	1607.31	1763.78	1763.78
27	1.49488	2679.27	18.0121	1) MD silty SAND	100	35	517.586	1237.32	1624.27	0	1624.27	1792.56	1792.56
28	1.49488	2716.89	19.0562	1) MD silty SAND	100	35	521.493	1246.66	1637.61	0	1637.61	1817.74	1817.74
29	1.49488	2749.02	20.107	1) MD silty SAND	100	35	524.333	1253.45	1647.3	0	1647.3	1839.25	1839.25
30	1.49488	2775.55	21.1648	1) MD silty SAND	100	35	526.098	1257.67	1653.33	0	1653.33	1857.02	1857.02
31	1.49488	2796.36	22.2303	1) MD silty SAND	100	35	526.785	1259.31	1655.66	0	1655.66	1870.97	1870.97
32	1.49488	2811.34	23.3039	1) MD silty SAND	100	35	526.375	1258.33	1654.26	0	1654.26	1881	1881
33	1.49488	2820.81	24.3863	1) MD silty SAND	100	35	524.94	1254.9	1649.37	0	1649.37	1887.34	1887.34
34	1.49488	2796.17	25.4781	1) MD silty SAND	100	35	517.582	1237.31	1624.25	0	1624.25	1870.88	1870.88
35	1.49488	2698.88	26.5798	1) MD silty SAND	100	35	497.808	1190.04	1556.73	0	1556.73	1805.8	1805.8
36	1.49488	2592.35	27.6923	1) MD silty SAND	100	35	476.616	1139.38	1484.39	0	1484.39	1734.54	1734.54
37	1.49488	2479.15	28.8162	1) MD silty SAND	100	35	454.475	1086.45	1408.79	0	1408.79	1658.81	1658.81
38	1.49488	2359.05	29.9524	1) MD silty SAND	100	35	431.366	1031.21	1329.9	0	1329.9	1578.47	1578.47
39	1.49488	2231.83	31.1017	1) MD silty SAND	100	35	407.277	973.621	1247.66	0	1247.66	1493.36	1493.36
40	1.49488	2097.22	32.2651	1) MD silty SAND	100	35	382.194	913.657	1162.02	0	1162.02	1403.31	1403.31
41	1.49488	1954.94	33.4436	1) MD silty SAND	100	35	356.098	851.274	1072.93	0	1072.93	1308.12	1308.12
42	1.49488	1804.69	34.6384	1) MD silty SAND	100	35	328.974	786.432	980.327	0	980.327	1207.6	1207.6
43	1.54482	1696.03	35.8712	6) Structural Fill	0	38	290.307	693.997	888.275	0	888.275	1098.2	1098.2
44	1.54482	1512.47	37.1442	6) Structural Fill	0	38	256.56	613.321	785.015	0	785.015	979.36	979.36
45	1.54482	1318.39	38.4389	6) Structural Fill	0	38	221.54	529.605	677.866	0	677.866	853.702	853.702
46	1.54482	1113.22	39.7573	6) Structural Fill	0	38	185.229	442.8	566.756	0	566.756	720.848	720.848
47	1.54482	896.303	41.1014	6) Structural Fill	0	38	147.602	352.851	451.629	0	451.629	580.397	580.397

48	1.54482	666.921	42.4737	6) Structural Fill	0	38	108.639	259.707	332.41	0	332.41	431.867	431.867
49	1.54482	424.243	43.8768	6) Structural Fill	0	38	68.317	163.316	209.035	0	209.035	274.724	274.724
50	1.54482	150.736	45.3138	6) Structural Fill	0	38	23.9787	57.3226	73.3697	0	73.3697	97.6125	97.6125

A-A' Proposed - Static

Global Minimum Query (bishop simplified) - Safety Factor: 2.39056

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.45566	39.0714	-7.15325	1) MD silty SAND	100	35	51.5865	123.321	33.3053	0	33.3053	26.8312	26.8312
2	1.45566	115.031	-6.18269	1) MD silty SAND	100	35	67.1035	160.415	86.2814	0	86.2814	79.0121	79.0121
3	1.45566	186.636	-5.21391	1) MD silty SAND	100	35	81.5626	194.98	135.646	0	135.646	128.203	128.203
4	1.45566	253.91	-4.24662	1) MD silty SAND	100	35	94.9853	227.068	181.472	0	181.472	174.419	174.419
5	1.45566	316.869	-3.28054	1) MD silty SAND	100	35	107.391	256.725	223.827	0	223.827	217.671	217.671
6	1.45566	375.528	-2.3154	1) MD silty SAND	100	35	118.799	283.997	262.774	0	262.774	257.971	257.971
7	1.45566	429.898	-1.35091	1) MD silty SAND	100	35	129.226	308.922	298.372	0	298.372	295.324	295.324
8	1.45566	479.986	-0.38681	1) MD silty SAND	100	35	138.687	331.54	330.673	0	330.673	329.737	329.737
9	1.45566	525.795	0.577183	1) MD silty SAND	100	35	147.197	351.884	359.727	0	359.727	361.21	361.21
10	1.45566	567.325	1.54134	1) MD silty SAND	100	35	154.77	369.986	385.579	0	385.579	389.744	389.744
11	1.45566	604.571	2.50593	1) MD silty SAND	100	35	161.416	385.875	408.271	0	408.271	415.335	415.335
12	1.45566	637.526	3.47124	1) MD silty SAND	100	35	167.148	399.577	427.841	0	427.841	437.98	437.98
13	1.40598	643.044	4.42102	3) VD SAND with silt	50	44	199.452	476.801	441.965	0	441.965	457.386	457.386
14	1.40598	665.885	5.35552	3) VD SAND with silt	50	44	204.501	488.873	454.466	0	454.466	473.637	473.637
15	1.40598	2376.9	6.29144	3) VD SAND with silt	50	44	673.867	1610.92	1616.38	0	1616.38	1690.67	1690.67
16	1.40598	2408.12	7.22905	3) VD SAND with silt	50	44	678.109	1621.06	1626.88	0	1626.88	1712.89	1712.89
17	1.40598	2353.34	8.16862	3) VD SAND with silt	50	44	658.917	1575.18	1579.37	0	1579.37	1673.95	1673.95
18	1.40598	2180.91	9.1104	3) VD SAND with silt	50	44	608.184	1453.9	1453.78	0	1453.78	1551.31	1551.31
19	1.40598	2190.28	10.0547	3) VD SAND with silt	50	44	606.816	1450.63	1450.4	0	1450.4	1557.99	1557.99
20	1.40598	2195.61	11.0017	3) VD SAND with silt	50	44	604.356	1444.75	1444.31	0	1444.31	1561.8	1561.8
21	1.40598	2207.67	11.9518	3) VD SAND with silt	50	44	603.67	1443.11	1442.61	0	1442.61	1570.39	1570.39
22	1.40598	2266.04	12.9052	3) VD SAND with silt	50	44	615.136	1470.52	1470.99	0	1470.99	1611.93	1611.93

23	1.49488	2475.12	13.8927	1) MD silty SAND	100	35	491.27	1174.41	1534.41	0	1534.41	1655.92	1655.92
24	1.49488	2534.45	14.9148	1) MD silty SAND	100	35	499.519	1194.13	1562.58	0	1562.58	1695.63	1695.63
25	1.49488	2587.97	15.9418	1) MD silty SAND	100	35	506.597	1211.05	1586.74	0	1586.74	1731.45	1731.45
26	1.49488	2636.27	16.9741	1) MD silty SAND	100	35	512.62	1225.45	1607.31	0	1607.31	1763.78	1763.78
27	1.49488	2679.27	18.0121	1) MD silty SAND	100	35	517.586	1237.32	1624.27	0	1624.27	1792.56	1792.56
28	1.49488	2716.89	19.0562	1) MD silty SAND	100	35	521.493	1246.66	1637.61	0	1637.61	1817.74	1817.74
29	1.49488	2749.02	20.107	1) MD silty SAND	100	35	524.333	1253.45	1647.3	0	1647.3	1839.25	1839.25
30	1.49488	2775.55	21.1648	1) MD silty SAND	100	35	526.098	1257.67	1653.33	0	1653.33	1857.02	1857.02
31	1.49488	2796.36	22.2303	1) MD silty SAND	100	35	526.785	1259.31	1655.66	0	1655.66	1870.97	1870.97
32	1.49488	2811.34	23.3039	1) MD silty SAND	100	35	526.375	1258.33	1654.26	0	1654.26	1881	1881
33	1.49488	2820.81	24.3863	1) MD silty SAND	100	35	524.94	1254.9	1649.37	0	1649.37	1887.34	1887.34
34	1.49488	2796.17	25.4781	1) MD silty SAND	100	35	517.582	1237.31	1624.25	0	1624.25	1870.88	1870.88
35	1.49488	2698.88	26.5798	1) MD silty SAND	100	35	497.808	1190.04	1556.73	0	1556.73	1805.8	1805.8
36	1.49488	2592.35	27.6923	1) MD silty SAND	100	35	476.616	1139.38	1484.39	0	1484.39	1734.54	1734.54
37	1.49488	2479.15	28.8162	1) MD silty SAND	100	35	454.475	1086.45	1408.79	0	1408.79	1658.81	1658.81
38	1.49488	2359.05	29.9524	1) MD silty SAND	100	35	431.366	1031.21	1329.9	0	1329.9	1578.47	1578.47
39	1.49488	2231.83	31.1017	1) MD silty SAND	100	35	407.277	973.621	1247.66	0	1247.66	1493.36	1493.36
40	1.49488	2097.22	32.2651	1) MD silty SAND	100	35	382.194	913.657	1162.02	0	1162.02	1403.31	1403.31
41	1.49488	1954.94	33.4436	1) MD silty SAND	100	35	356.098	851.274	1072.93	0	1072.93	1308.12	1308.12
42	1.49488	1804.69	34.6384	1) MD silty SAND	100	35	328.974	786.432	980.327	0	980.327	1207.6	1207.6
43	1.54482	1696.03	35.8712	6) Structural Fill	0	38	290.307	693.997	888.275	0	888.275	1098.2	1098.2
44	1.54482	1512.47	37.1442	6) Structural Fill	0	38	256.56	613.321	785.015	0	785.015	979.36	979.36
45	1.54482	1318.39	38.4389	6) Structural Fill	0	38	221.54	529.605	677.866	0	677.866	853.702	853.702
46	1.54482	1113.22	39.7573	6) Structural Fill	0	38	185.229	442.8	566.756	0	566.756	720.848	720.848
47	1.54482	896.303	41.1014	6) Structural Fill	0	38	147.602	352.851	451.629	0	451.629	580.397	580.397

48	1.54482	666.921	42.4737	6) Structural Fill	0	38	108.639	259.707	332.41	0	332.41	431.867	431.867
49	1.54482	424.243	43.8768	6) Structural Fill	0	38	68.317	163.316	209.035	0	209.035	274.724	274.724
50	1.54482	150.736	45.3138	6) Structural Fill	0	38	23.9787	57.3226	73.3697	0	73.3697	97.6125	97.6125

A-A' Proposed - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.15844

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.65572	40.1408	-3.5605	1) MD silty SAND	100	35	104.921	121.545	30.7688	0	30.7688	24.2404	24.2404
2	1.65572	118.111	-2.75779	1) MD silty SAND	100	35	133.32	154.444	77.7541	0	77.7541	71.3321	71.3321
3	1.65572	191.463	-1.95562	1) MD silty SAND	100	35	159.509	184.782	121.081	0	121.081	115.635	115.635
4	1.65572	260.204	-1.15383	1) MD silty SAND	100	35	183.547	212.628	160.85	0	160.85	157.153	157.153
5	1.65572	324.34	-0.352267	1) MD silty SAND	100	35	205.491	238.049	197.154	0	197.154	195.89	195.89
6	1.65572	383.874	0.449226	1) MD silty SAND	100	35	225.394	261.105	230.082	0	230.082	231.849	231.849
7	1.65572	438.806	1.25081	1) MD silty SAND	100	35	243.305	281.854	259.715	0	259.715	265.027	265.027
8	1.65572	489.131	2.05263	1) MD silty SAND	100	35	259.273	300.352	286.132	0	286.132	295.425	295.425
9	1.65572	534.846	2.85486	1) MD silty SAND	100	35	273.34	316.648	309.406	0	309.406	323.037	323.037
10	1.65572	575.941	3.65765	1) MD silty SAND	100	35	285.55	330.792	329.606	0	329.606	347.86	347.86
11	1.65572	612.406	4.46116	1) MD silty SAND	100	35	295.94	342.829	346.796	0	346.796	369.885	369.885
12	1.65572	644.226	5.26555	1) MD silty SAND	100	35	304.549	352.802	361.039	0	361.039	389.107	389.107
13	1.65572	671.386	6.07098	1) MD silty SAND	100	35	311.412	360.752	372.392	0	372.392	405.513	405.513
14	1.65572	2670.64	6.87762	1) MD silty SAND	100	35	989.192	1145.92	1493.73	0	1493.73	1613.04	1613.04
15	1.65572	2710.47	7.68563	1) MD silty SAND	100	35	994.717	1152.32	1502.87	0	1502.87	1637.11	1637.11
16	1.65572	2552.08	8.49518	1) MD silty SAND	100	35	933.736	1081.68	1401.98	0	1401.98	1541.45	1541.45
17	1.65572	2460.27	9.30645	1) MD silty SAND	100	35	895.793	1037.72	1339.21	0	1339.21	1486	1486
18	1.65572	2472.5	10.1196	1) MD silty SAND	100	35	892.685	1034.12	1334.07	0	1334.07	1493.39	1493.39
19	1.65572	2492.82	10.9348	1) MD silty SAND	100	35	892.222	1033.59	1333.3	0	1333.3	1505.68	1505.68
20	1.65572	2578.57	11.7523	1) MD silty SAND	100	35	912.923	1057.57	1367.55	0	1367.55	1557.47	1557.47
21	1.65572	2668.49	12.5722	1) MD silty SAND	100	35	934.574	1082.65	1403.37	0	1403.37	1611.79	1611.79
22	1.65572	2749.33	13.3947	1) MD silty SAND	100	35	952.911	1103.89	1433.7	0	1433.7	1660.62	1660.62

23	1.65572	2824.92	14.2201	1) MD silty SAND	100	35	969.217	1122.78	1460.68	0	1460.68	1706.29	1706.29
24	1.65572	2895.46	15.0484	1) MD silty SAND	100	35	983.59	1139.43	1484.46	0	1484.46	1748.9	1748.9
25	1.65572	2960.89	15.88	1) MD silty SAND	100	35	996.046	1153.86	1505.07	0	1505.07	1788.43	1788.43
26	1.65572	3021.15	16.7151	1) MD silty SAND	100	35	1006.61	1166.1	1522.55	0	1522.55	1824.83	1824.83
27	1.65572	3076.17	17.5538	1) MD silty SAND	100	35	1015.29	1176.15	1536.9	0	1536.9	1858.07	1858.07
28	1.65572	3125.88	18.3964	1) MD silty SAND	100	35	1022.1	1184.04	1548.17	0	1548.17	1888.1	1888.1
29	1.65572	3170.23	19.2432	1) MD silty SAND	100	35	1027.06	1189.79	1556.37	0	1556.37	1914.9	1914.9
30	1.65572	3209.65	20.0944	1) MD silty SAND	100	35	1030.33	1193.57	1561.79	0	1561.79	1938.72	1938.72
31	1.65572	3178.39	20.9502	1) MD silty SAND	100	35	1012.46	1172.87	1532.21	0	1532.21	1919.85	1919.85
32	1.65572	3087.53	21.8109	1) MD silty SAND	100	35	977.211	1132.04	1473.9	0	1473.9	1864.97	1864.97
33	1.65572	2990.92	22.6769	1) MD silty SAND	100	35	940.73	1089.78	1413.55	0	1413.55	1806.62	1806.62
34	1.65572	2888.44	23.5483	1) MD silty SAND	100	35	903.028	1046.1	1351.18	0	1351.18	1744.73	1744.73
35	1.65572	2779.99	24.4256	1) MD silty SAND	100	35	864.109	1001.02	1286.79	0	1286.79	1679.23	1679.23
36	1.65572	2665.45	25.309	1) MD silty SAND	100	35	823.979	954.53	1220.39	0	1220.39	1610.05	1610.05
37	1.65572	2544.67	26.1989	1) MD silty SAND	100	35	782.644	906.646	1152.01	0	1152.01	1537.1	1537.1
38	1.65572	2417.52	27.0957	1) MD silty SAND	100	35	740.11	857.373	1081.64	0	1081.64	1460.31	1460.31
39	1.65572	2283.85	27.9997	1) MD silty SAND	100	35	696.382	806.717	1009.3	0	1009.3	1379.56	1379.56
40	1.65572	2143.49	28.9113	1) MD silty SAND	100	35	651.467	754.686	934.992	0	934.992	1294.79	1294.79
41	1.65572	1996.27	29.8311	1) MD silty SAND	100	35	605.372	701.287	858.727	0	858.727	1205.86	1205.86
42	1.65572	1842	30.7594	1) MD silty SAND	100	35	558.101	646.526	780.519	0	780.519	1112.68	1112.68
43	1.65572	1680.47	31.6967	1) MD silty SAND	100	35	509.66	590.41	700.379	0	700.379	1015.11	1015.11
44	1.65572	1511.46	32.6436	1) MD silty SAND	100	35	460.057	532.949	618.315	0	618.315	913.028	913.028
45	1.60101	1285.81	33.5847	6) Structural Fill	0	38	374.17	433.454	554.797	0	554.797	803.251	803.251
46	1.60101	1073.49	34.5201	6) Structural Fill	0	38	308.966	357.918	458.114	0	458.114	670.62	670.62
47	1.60101	849.179	35.4662	6) Structural Fill	0	38	241.666	279.956	358.327	0	358.327	530.491	530.491

48	1.60101	616.838	36.4235	6) Structural Fill	0	38	173.53	201.024	257.299	0	257.299	385.346	385.346
49	1.60101	376.173	37.3928	6) Structural Fill	0	38	104.579	121.149	155.064	0	155.064	235	235
50	1.60101	126.86	38.3749	6) Structural Fill	0	38	34.8419	40.3623	51.6616	0	51.6616	79.2521	79.2521

A-A' Proposed - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 2.12532

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.49892	58.7304	-1.81854	1 No Cohesion	0	35	7.82485	16.6303	23.7505	0	23.7505	23.5021	23.5021
2	2.49892	170.951	-1.01768	1 No Cohesion	0	35	22.6709	48.1829	68.8121	0	68.8121	68.4094	68.4094
3	2.49892	272.694	-0.217011	1 No Cohesion	0	35	35.9972	76.5055	109.261	0	109.261	109.125	109.125
4	2.49892	385.092	0.583611	1 No Cohesion	0	35	50.6013	107.544	153.589	0	153.589	154.104	154.104
5	2.49892	508.466	1.38435	1 No Cohesion	0	35	66.5076	141.35	201.869	0	201.869	203.477	203.477
6	2.49892	621.36	2.18535	1 No Cohesion	0	35	80.9045	171.948	245.568	0	245.568	248.655	248.655
7	2.49892	723.759	2.98679	1 No Cohesion	0	35	93.8103	199.377	284.739	0	284.739	289.634	289.634
8	2.49892	815.642	3.78881	1 No Cohesion	0	35	105.242	223.672	319.437	0	319.437	326.406	326.406
9	2.49892	896.985	4.59157	1 No Cohesion	0	35	115.214	244.867	349.707	0	349.707	358.96	358.96
10	2.49892	967.755	5.39524	1 No Cohesion	0	35	123.744	262.995	375.596	0	375.596	387.282	387.282
11	2.49892	1027.91	6.19998	1 No Cohesion	0	35	130.843	278.083	397.144	0	397.144	411.358	411.358
12	2.49892	1680.61	7.00594	1 No Cohesion	0	35	212.96	452.609	646.391	0	646.391	672.562	672.562
13	2.49892	4170.5	7.8133	1 No Cohesion	0	35	526.085	1118.1	1596.81	0	1596.81	1669	1669
14	2.49892	3890	8.62223	1 No Cohesion	0	35	488.486	1038.19	1482.68	0	1482.68	1556.76	1556.76
15	2.49892	3776.29	9.43289	1 No Cohesion	0	35	472.061	1003.28	1432.83	0	1432.83	1511.26	1511.26
16	2.49892	3839.72	10.2455	1 No Cohesion	0	35	477.81	1015.5	1450.28	0	1450.28	1536.65	1536.65
17	2.49892	4049.6	11.0601	1 No Cohesion	0	35	501.633	1066.13	1522.6	0	1522.6	1620.65	1620.65
18	2.49892	4256.42	11.8771	1 No Cohesion	0	35	524.843	1115.46	1593.04	0	1593.04	1703.42	1703.42
19	2.49892	4449.57	12.6964	1 No Cohesion	0	35	546.144	1160.73	1657.69	0	1657.69	1780.73	1780.73
20	2.49892	4631.44	13.5185	1 No Cohesion	0	35	565.844	1202.6	1717.49	0	1717.49	1853.53	1853.53
21	2.49892	4801.92	14.3434	1 No Cohesion	0	35	583.95	1241.08	1772.44	0	1772.44	1921.76	1921.76
22	2.49892	4960.88	15.1713	1 No Cohesion	0	35	600.465	1276.18	1822.57	0	1822.57	1985.39	1985.39
23	2.49892	5108.89	16.0025	1 No Cohesion	0	35	615.47	1308.07	1868.12	0	1868.12	2044.63	2044.63
24	2.49892	5113.88	16.8372	1 No Cohesion	0	35	613.155	1303.15	1861.08	0	1861.08	2046.64	2046.64
25	2.49892	4967.54	17.6755	1 No Cohesion	0	35	592.758	1259.8	1799.19	0	1799.19	1988.08	1988.08
26	2.49892	4809.07	18.5178	1 No Cohesion	0	35	571.081	1213.73	1733.39	0	1733.39	1924.67	1924.67
27	2.49892	4638.31	19.3643	1 No Cohesion	0	35	548.12	1164.93	1663.7	0	1663.7	1856.34	1856.34
28	2.49892	4455.09	20.2151	1 No Cohesion	0	35	523.879	1113.41	1590.11	0	1590.11	1783.02	1783.02
29	2.49892	4259.19	21.0707	1 No Cohesion	0	35	498.348	1059.15	1512.62	0	1512.62	1704.62	1704.62
30	2.49892	4050.4	21.9312	1 No Cohesion	0	35	471.529	1002.15	1431.22	0	1431.22	1621.07	1621.07
31	2.49892	3828.48	22.797	1 No Cohesion	0	35	443.417	942.404	1345.89	0	1345.89	1532.26	1532.26
32	2.49892	3593.21	23.6682	1 No Cohesion	0	35	414.012	879.907	1256.64	0	1256.64	1438.1	1438.1

33	2.49892	3337.13	24.5454	1 No Cohesion	0	35	382.485	812.902	1160.94	0	1160.94	1335.62	1335.62
34	2.49892	2993.19	25.4287	1 No Cohesion	0	35	341.232	725.228	1035.74	0	1035.74	1197.97	1197.97
35	2.49892	2607.38	26.3185	1 No Cohesion	0	35	295.635	628.318	897.33	0	897.33	1043.56	1043.56
36	2.49892	2205.95	27.2152	1 No Cohesion	0	35	248.737	528.646	754.982	0	754.982	882.9	882.9
37	2.49892	1825.8	28.1192	1 No Cohesion	0	35	204.713	435.081	621.358	0	621.358	730.753	730.753
38	2.49892	1795.94	29.0309	1 No Cohesion	0	35	200.209	425.509	607.69	0	607.69	718.809	718.809
39	2.49892	1845.38	29.9508	1 No Cohesion	0	35	204.514	434.658	620.754	0	620.754	738.596	738.596
40	2.49892	1878.71	30.8792	1 No Cohesion	0	35	206.96	439.857	628.183	0	628.183	751.944	751.944
41	2.49892	1895.47	31.8167	1 No Cohesion	0	35	207.526	441.06	629.899	0	629.899	758.654	758.654
42	2.49892	1895.15	32.7638	1 No Cohesion	0	35	206.189	438.217	625.84	0	625.84	758.535	758.535
43	2.49892	1877.23	33.7211	1 No Cohesion	0	35	202.921	431.273	615.921	0	615.921	751.361	751.361
44	2.49892	1841.09	34.6892	1 No Cohesion	0	35	197.698	420.171	600.066	0	600.066	736.903	736.903
45	2.49892	1730.05	35.6688	1 No Cohesion	0	35	184.509	392.14	560.032	0	560.032	692.463	692.463
46	2.49892	1475.01	36.6605	1 No Cohesion	0	35	156.205	331.985	474.125	0	474.125	590.389	590.389
47	2.49892	1195.13	37.6652	1 No Cohesion	0	35	125.648	267.042	381.375	0	381.375	478.365	478.365
48	2.49892	894.13	38.6837	1 No Cohesion	0	35	93.2984	198.289	283.185	0	283.185	357.888	357.888
49	2.49892	571.096	39.7169	1 No Cohesion	0	35	59.1285	125.667	179.471	0	179.471	228.59	228.59
50	2.49892	211.752	40.7659	1 No Cohesion	0	35	21.7472	46.2198	66.0088	0	66.0088	84.758	84.758

B-B' Existing - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 2.50286

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.29398	121.418	-0.547028	1) MD silty SAND	100	35	54.9085	137.428	53.453	0	53.453	52.9288	52.9288
2	2.29398	359.479	0.319315	1) MD silty SAND	100	35	83.6643	209.4	156.239	0	156.239	156.705	156.705
3	2.29398	587.99	1.18573	1) MD silty SAND	100	35	111.02	277.867	254.021	0	254.021	256.319	256.319
4	2.29398	806.946	2.05242	1) MD silty SAND	100	35	136.992	342.872	346.857	0	346.857	351.766	351.766
5	2.29398	1016.33	2.91957	1) MD silty SAND	100	35	161.596	404.452	434.802	0	434.802	443.043	443.043
6	2.25241	1192.4	3.77953	3) VD SAND with silt	50	44	218.661	547.277	514.946	0	514.946	529.391	529.391
7	2.25241	1391.37	4.63247	3) VD SAND with silt	50	44	250.485	626.929	597.426	0	597.426	617.722	617.722
8	2.25241	1618.92	5.48643	3) VD SAND with silt	50	44	286.671	717.498	691.217	0	691.217	718.751	718.751
9	2.25241	1839.02	6.34163	3) VD SAND with silt	50	44	321.223	803.977	780.764	0	780.764	816.464	816.464
10	2.25241	2049.9	7.19824	3) VD SAND with silt	50	44	353.878	885.706	865.399	0	865.399	910.093	910.093
11	2.25241	2251.54	8.05648	3) VD SAND with silt	50	44	384.654	962.736	945.164	0	945.164	999.61	999.61
12	2.25241	2443.86	8.91653	3) VD SAND with silt	50	44	413.57	1035.11	1020.11	0	1020.11	1085	1085
13	2.25241	2626.8	9.77862	3) VD SAND with silt	50	44	440.644	1102.87	1090.27	0	1090.27	1166.22	1166.22
14	2.25241	2800.3	10.643	3) VD SAND with silt	50	44	465.883	1166.04	1155.7	0	1155.7	1243.25	1243.25
15	2.25241	2964.27	11.5097	3) VD SAND with silt	50	44	489.308	1224.67	1216.41	0	1216.41	1316.05	1316.05
16	2.25241	3118.64	12.3792	3) VD SAND with silt	50	44	510.927	1278.78	1272.44	0	1272.44	1384.58	1384.58
17	2.25241	3263.31	13.2516	3) VD SAND with silt	50	44	530.753	1328.4	1323.82	0	1323.82	1448.81	1448.81
18	2.25241	3398.17	14.1271	3) VD SAND with silt	50	44	548.788	1373.54	1370.56	0	1370.56	1508.69	1508.69
19	2.25241	3523.13	15.006	3) VD SAND with silt	50	44	565.042	1414.22	1412.69	0	1412.69	1564.16	1564.16
20	2.25241	3638.05	15.8885	3) VD SAND with silt	50	44	579.525	1450.47	1450.22	0	1450.22	1615.18	1615.18
21	2.25241	3742.81	16.7749	3) VD SAND with silt	50	44	592.234	1482.28	1483.17	0	1483.17	1661.69	1661.69
22	2.25241	3837.27	17.6655	3) VD SAND with silt	50	44	603.178	1509.67	1511.53	0	1511.53	1703.63	1703.63

23	2.25241	3921.28	18.5605	3) VD SAND with silt	50	44	612.355	1532.64	1535.32	0	1535.32	1740.93	1740.93
24	2.25241	3994.68	19.4602	3) VD SAND with silt	50	44	619.767	1551.19	1554.53	0	1554.53	1773.51	1773.51
25	2.25241	4057.29	20.365	3) VD SAND with silt	50	44	625.413	1565.32	1569.16	0	1569.16	1801.31	1801.31
26	2.25241	4102.52	21.2751	3) VD SAND with silt	50	44	628.333	1572.63	1576.73	0	1576.73	1821.39	1821.39
27	2.25241	4115.2	22.1908	3) VD SAND with silt	50	44	626.331	1567.62	1571.54	0	1571.54	1827.02	1827.02
28	2.25241	4114.78	23.1126	3) VD SAND with silt	50	44	622.348	1557.65	1561.22	0	1561.22	1826.84	1826.84
29	2.25241	4102.75	24.0407	3) VD SAND with silt	50	44	616.639	1543.36	1546.43	0	1546.43	1821.5	1821.5
30	2.25241	4078.84	24.9756	3) VD SAND with silt	50	44	609.195	1524.73	1527.12	0	1527.12	1810.88	1810.88
31	2.25241	4042.8	25.9176	3) VD SAND with silt	50	44	600.002	1501.72	1503.3	0	1503.3	1794.88	1794.88
32	2.25241	3994.33	26.8673	3) VD SAND with silt	50	44	589.058	1474.33	1474.94	0	1474.94	1773.36	1773.36
33	2.25241	3933.12	27.825	3) VD SAND with silt	50	44	576.345	1442.51	1441.99	0	1441.99	1746.18	1746.18
34	2.25241	3858.84	28.7912	3) VD SAND with silt	50	44	561.857	1406.25	1404.44	0	1404.44	1713.21	1713.21
35	2.20928	3699.86	29.757	2) D SAND with silt	50	40	487.914	1221.18	1395.75	0	1395.75	1674.7	1674.7
36	2.20928	3602.44	30.7228	2) D SAND with silt	50	40	472.503	1182.61	1349.79	0	1349.79	1630.6	1630.6
37	2.20928	3475.34	31.6984	2) D SAND with silt	50	40	453.469	1134.97	1293.02	0	1293.02	1573.07	1573.07
38	2.20928	3315.78	32.6843	2) D SAND with silt	50	40	430.535	1077.57	1224.62	0	1224.62	1500.85	1500.85
39	2.20928	3141.9	33.6813	2) D SAND with silt	50	40	406.038	1016.26	1151.54	0	1151.54	1422.14	1422.14
40	2.20928	2953.2	34.69	2) D SAND with silt	50	40	379.954	950.972	1073.74	0	1073.74	1336.73	1336.73
41	2.20928	2749.15	35.7111	2) D SAND with silt	50	40	352.263	881.666	991.141	0	991.141	1244.37	1244.37
42	2.20928	2529.16	36.7455	2) D SAND with silt	50	40	322.943	808.28	903.684	0	903.684	1144.8	1144.8
43	2.20928	2292.58	37.794	2) D SAND with silt	50	40	291.966	730.751	811.287	0	811.287	1037.71	1037.71
44	2.20928	2038.71	38.8576	2) D SAND with silt	50	40	259.309	649.014	713.878	0	713.878	922.797	922.797
45	2.20928	1766.75	39.9374	2) D SAND with silt	50	40	224.943	563	611.369	0	611.369	799.7	799.7
46	2.20928	1475.86	41.0345	2) D SAND with silt	50	40	188.838	472.635	503.678	0	503.678	668.032	668.032
47	2.0868	1109.15	42.1188	1) MD silty SAND	100	35	150.565	376.844	395.376	0	395.376	531.512	531.512

48	2.0868	814.259	43.1905	1) MD silty SAND	100	35	118.1	295.589	279.331	0	279.331	390.197	390.197
49	2.0868	500.831	44.2813	1) MD silty SAND	100	35	84.1413	210.594	157.945	0	157.945	240.001	240.001
50	2.0868	169.879	45.3928	1) MD silty SAND	100	35	48.8686	122.311	31.8639	0	31.8639	81.4072	81.4072

B-B' Existing - Static

Global Minimum Query (bishop simplified) - Safety Factor: 2.50286

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.29398	121.418	-0.547028	1) MD silty SAND	100	35	54.9085	137.428	53.453	0	53.453	52.9288	52.9288
2	2.29398	359.479	0.319315	1) MD silty SAND	100	35	83.6643	209.4	156.239	0	156.239	156.705	156.705
3	2.29398	587.99	1.18573	1) MD silty SAND	100	35	111.02	277.867	254.021	0	254.021	256.319	256.319
4	2.29398	806.946	2.05242	1) MD silty SAND	100	35	136.992	342.872	346.857	0	346.857	351.766	351.766
5	2.29398	1016.33	2.91957	1) MD silty SAND	100	35	161.596	404.452	434.802	0	434.802	443.043	443.043
6	2.25241	1192.4	3.77953	3) VD SAND with silt	50	44	218.661	547.277	514.946	0	514.946	529.391	529.391
7	2.25241	1391.37	4.63247	3) VD SAND with silt	50	44	250.485	626.929	597.426	0	597.426	617.722	617.722
8	2.25241	1618.92	5.48643	3) VD SAND with silt	50	44	286.671	717.498	691.217	0	691.217	718.751	718.751
9	2.25241	1839.02	6.34163	3) VD SAND with silt	50	44	321.223	803.977	780.764	0	780.764	816.464	816.464
10	2.25241	2049.9	7.19824	3) VD SAND with silt	50	44	353.878	885.706	865.399	0	865.399	910.093	910.093
11	2.25241	2251.54	8.05648	3) VD SAND with silt	50	44	384.654	962.736	945.164	0	945.164	999.61	999.61
12	2.25241	2443.86	8.91653	3) VD SAND with silt	50	44	413.57	1035.11	1020.11	0	1020.11	1085	1085
13	2.25241	2626.8	9.77862	3) VD SAND with silt	50	44	440.644	1102.87	1090.27	0	1090.27	1166.22	1166.22
14	2.25241	2800.3	10.643	3) VD SAND with silt	50	44	465.883	1166.04	1155.7	0	1155.7	1243.25	1243.25
15	2.25241	2964.27	11.5097	3) VD SAND with silt	50	44	489.308	1224.67	1216.41	0	1216.41	1316.05	1316.05
16	2.25241	3118.64	12.3792	3) VD SAND with silt	50	44	510.927	1278.78	1272.44	0	1272.44	1384.58	1384.58
17	2.25241	3263.31	13.2516	3) VD SAND with silt	50	44	530.753	1328.4	1323.82	0	1323.82	1448.81	1448.81
18	2.25241	3398.17	14.1271	3) VD SAND with silt	50	44	548.788	1373.54	1370.56	0	1370.56	1508.69	1508.69
19	2.25241	3523.13	15.006	3) VD SAND with silt	50	44	565.042	1414.22	1412.69	0	1412.69	1564.16	1564.16
20	2.25241	3638.05	15.8885	3) VD SAND with silt	50	44	579.525	1450.47	1450.22	0	1450.22	1615.18	1615.18
21	2.25241	3742.81	16.7749	3) VD SAND with silt	50	44	592.234	1482.28	1483.17	0	1483.17	1661.69	1661.69
22	2.25241	3837.27	17.6655	3) VD SAND with silt	50	44	603.178	1509.67	1511.53	0	1511.53	1703.63	1703.63

23	2.25241	3921.28	18.5605	3) VD SAND with silt	50	44	612.355	1532.64	1535.32	0	1535.32	1740.93	1740.93
24	2.25241	3994.68	19.4602	3) VD SAND with silt	50	44	619.767	1551.19	1554.53	0	1554.53	1773.51	1773.51
25	2.25241	4057.29	20.365	3) VD SAND with silt	50	44	625.413	1565.32	1569.16	0	1569.16	1801.31	1801.31
26	2.25241	4102.52	21.2751	3) VD SAND with silt	50	44	628.333	1572.63	1576.73	0	1576.73	1821.39	1821.39
27	2.25241	4115.2	22.1908	3) VD SAND with silt	50	44	626.331	1567.62	1571.54	0	1571.54	1827.02	1827.02
28	2.25241	4114.78	23.1126	3) VD SAND with silt	50	44	622.348	1557.65	1561.22	0	1561.22	1826.84	1826.84
29	2.25241	4102.75	24.0407	3) VD SAND with silt	50	44	616.639	1543.36	1546.43	0	1546.43	1821.5	1821.5
30	2.25241	4078.84	24.9756	3) VD SAND with silt	50	44	609.195	1524.73	1527.12	0	1527.12	1810.88	1810.88
31	2.25241	4042.8	25.9176	3) VD SAND with silt	50	44	600.002	1501.72	1503.3	0	1503.3	1794.88	1794.88
32	2.25241	3994.33	26.8673	3) VD SAND with silt	50	44	589.058	1474.33	1474.94	0	1474.94	1773.36	1773.36
33	2.25241	3933.12	27.825	3) VD SAND with silt	50	44	576.345	1442.51	1441.99	0	1441.99	1746.18	1746.18
34	2.25241	3858.84	28.7912	3) VD SAND with silt	50	44	561.857	1406.25	1404.44	0	1404.44	1713.21	1713.21
35	2.20928	3699.86	29.757	2) D SAND with silt	50	40	487.914	1221.18	1395.75	0	1395.75	1674.7	1674.7
36	2.20928	3602.44	30.7228	2) D SAND with silt	50	40	472.503	1182.61	1349.79	0	1349.79	1630.6	1630.6
37	2.20928	3475.34	31.6984	2) D SAND with silt	50	40	453.469	1134.97	1293.02	0	1293.02	1573.07	1573.07
38	2.20928	3315.78	32.6843	2) D SAND with silt	50	40	430.535	1077.57	1224.62	0	1224.62	1500.85	1500.85
39	2.20928	3141.9	33.6813	2) D SAND with silt	50	40	406.038	1016.26	1151.54	0	1151.54	1422.14	1422.14
40	2.20928	2953.2	34.69	2) D SAND with silt	50	40	379.954	950.972	1073.74	0	1073.74	1336.73	1336.73
41	2.20928	2749.15	35.7111	2) D SAND with silt	50	40	352.263	881.666	991.141	0	991.141	1244.37	1244.37
42	2.20928	2529.16	36.7455	2) D SAND with silt	50	40	322.943	808.28	903.684	0	903.684	1144.8	1144.8
43	2.20928	2292.58	37.794	2) D SAND with silt	50	40	291.966	730.751	811.287	0	811.287	1037.71	1037.71
44	2.20928	2038.71	38.8576	2) D SAND with silt	50	40	259.309	649.014	713.878	0	713.878	922.797	922.797
45	2.20928	1766.75	39.9374	2) D SAND with silt	50	40	224.943	563	611.369	0	611.369	799.7	799.7
46	2.20928	1475.86	41.0345	2) D SAND with silt	50	40	188.838	472.635	503.678	0	503.678	668.032	668.032
47	2.0868	1109.15	42.1188	1) MD silty SAND	100	35	150.565	376.844	395.376	0	395.376	531.512	531.512

48	2.0868	814.259	43.1905	1) MD silty SAND	100	35	118.1	295.589	279.331	0	279.331	390.197	390.197
49	2.0868	500.831	44.2813	1) MD silty SAND	100	35	84.1413	210.594	157.945	0	157.945	240.001	240.001
50	2.0868	169.879	45.3928	1) MD silty SAND	100	35	48.8686	122.311	31.8639	0	31.8639	81.4072	81.4072

B-B' Existing - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.27152

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.289	120.106	-0.404033	1) MD silty SAND	100	35	107.959	137.272	53.2302	0	53.2302	52.4689	52.4689
2	2.289	355.829	0.414137	1) MD silty SAND	100	35	163.601	208.022	154.272	0	154.272	155.455	155.455
3	2.289	582.572	1.23239	1) MD silty SAND	100	35	216.245	274.96	249.869	0	249.869	254.521	254.521
4	2.289	800.329	2.0509	1) MD silty SAND	100	35	265.956	338.169	340.141	0	340.141	349.665	349.665
5	2.289	1009.09	2.86982	1) MD silty SAND	100	35	312.799	397.73	425.202	0	425.202	440.883	440.883
6	2.31034	1221.01	3.69316	3) VD SAND with silt	50	44	420.157	534.238	501.446	0	501.446	528.566	528.566
7	2.31034	1439.08	4.52108	3) VD SAND with silt	50	44	483.43	614.691	584.755	0	584.755	622.981	622.981
8	2.31034	1681.44	5.34995	3) VD SAND with silt	50	44	552.841	702.948	676.146	0	676.146	727.917	727.917
9	2.31034	1914.69	6.17995	3) VD SAND with silt	50	44	618.038	785.848	761.992	0	761.992	828.914	828.914
10	2.31034	2138.54	7.01125	3) VD SAND with silt	50	44	679.055	863.432	842.335	0	842.335	925.847	925.847
11	2.31034	2352.95	7.84404	3) VD SAND with silt	50	44	735.991	935.827	917.3	0	917.3	1018.69	1018.69
12	2.31034	2557.86	8.6785	3) VD SAND with silt	50	44	788.936	1003.15	987.015	0	987.015	1107.44	1107.44
13	2.31034	2753.22	9.51482	3) VD SAND with silt	50	44	837.981	1065.51	1051.59	0	1051.59	1192.04	1192.04
14	2.31034	2938.95	10.3532	3) VD SAND with silt	50	44	883.203	1123.01	1111.13	0	1111.13	1272.48	1272.48
15	2.31034	3114.98	11.1938	3) VD SAND with silt	50	44	924.673	1175.74	1165.74	0	1165.74	1348.73	1348.73
16	2.31034	3281.23	12.0369	3) VD SAND with silt	50	44	962.478	1223.81	1215.51	0	1215.51	1420.74	1420.74
17	2.31034	3437.61	12.8826	3) VD SAND with silt	50	44	996.673	1267.29	1260.54	0	1260.54	1488.49	1488.49
18	2.31034	3584.02	13.7312	3) VD SAND with silt	50	44	1027.32	1306.26	1300.89	0	1300.89	1551.92	1551.92
19	2.31034	3720.36	14.5828	3) VD SAND with silt	50	44	1054.48	1340.79	1336.65	0	1336.65	1610.99	1610.99
20	2.31034	3846.52	15.4378	3) VD SAND with silt	50	44	1078.21	1370.96	1367.9	0	1367.9	1665.65	1665.65
21	2.31034	3962.36	16.2963	3) VD SAND with silt	50	44	1098.56	1396.84	1394.69	0	1394.69	1715.85	1715.85
22	2.31034	4067.77	17.1586	3) VD SAND with silt	50	44	1115.57	1418.47	1417.09	0	1417.09	1761.53	1761.53

23	2.31034	4162.59	18.0249	3) VD SAND with silt	50	44	1129.29	1435.92	1435.16	0	1435.16	1802.63	1802.63
24	2.31034	4246.67	18.8956	3) VD SAND with silt	50	44	1139.77	1449.24	1448.95	0	1448.95	1839.08	1839.08
25	2.31034	4318.47	19.7707	3) VD SAND with silt	50	44	1146.67	1458.02	1458.05	0	1458.05	1870.22	1870.22
26	2.31034	4357.2	20.6507	3) VD SAND with silt	50	44	1144.8	1455.63	1455.57	0	1455.57	1887.02	1887.02
27	2.31034	4376.99	21.5358	3) VD SAND with silt	50	44	1137.95	1446.93	1446.56	0	1446.56	1895.64	1895.64
28	2.31034	4385.32	22.4264	3) VD SAND with silt	50	44	1128.17	1434.49	1433.68	0	1433.68	1899.28	1899.28
29	2.31034	4381.95	23.3227	3) VD SAND with silt	50	44	1115.46	1418.33	1416.95	0	1416.95	1897.86	1897.86
30	2.31034	4366.66	24.2251	3) VD SAND with silt	50	44	1099.86	1398.49	1396.4	0	1396.4	1891.28	1891.28
31	2.31034	4339.19	25.1339	3) VD SAND with silt	50	44	1081.38	1375	1372.08	0	1372.08	1879.42	1879.42
32	2.31034	4299.28	26.0495	3) VD SAND with silt	50	44	1060.06	1347.89	1344.01	0	1344.01	1862.17	1862.17
33	2.31034	4246.63	26.9724	3) VD SAND with silt	50	44	1035.92	1317.19	1312.21	0	1312.21	1839.41	1839.41
34	2.31034	4180.94	27.9029	3) VD SAND with silt	50	44	1008.96	1282.91	1276.71	0	1276.71	1810.99	1810.99
35	2.28836	4063.28	28.8369	2) D SAND with silt	50	40	888.912	1130.27	1287.41	0	1287.41	1776.84	1776.84
36	2.28836	3957.24	29.7749	2) D SAND with silt	50	40	857.548	1090.39	1239.89	0	1239.89	1730.51	1730.51
37	2.28836	3815.38	30.7218	2) D SAND with silt	50	40	819.153	1041.57	1181.71	0	1181.71	1668.51	1668.51
38	2.28836	3659.21	31.6781	2) D SAND with silt	50	40	778.378	989.723	1119.92	0	1119.92	1600.24	1600.24
39	2.28836	3488.47	32.6444	2) D SAND with silt	50	40	735.263	934.902	1054.58	0	1054.58	1525.61	1525.61
40	2.28836	3302.7	33.6212	2) D SAND with silt	50	40	689.815	877.114	985.716	0	985.716	1444.4	1444.4
41	2.28836	3101.38	34.6092	2) D SAND with silt	50	40	642.039	816.365	913.319	0	913.319	1356.38	1356.38
42	2.28836	2883.96	35.6091	2) D SAND with silt	50	40	591.938	752.661	837.399	0	837.399	1261.33	1261.33
43	2.28836	2649.85	36.6217	2) D SAND with silt	50	40	539.518	686.008	757.963	0	757.963	1158.96	1158.96
44	2.28836	2398.37	37.6477	2) D SAND with silt	50	40	484.783	616.411	675.023	0	675.023	1049	1049
45	2.28836	2128.8	38.6882	2) D SAND with silt	50	40	427.74	543.88	588.582	0	588.582	931.121	931.121
46	2.28836	1840.36	39.744	2) D SAND with silt	50	40	368.397	468.424	498.658	0	498.658	804.984	804.984
47	2.28836	1532.16	40.8162	2) D SAND with silt	50	40	306.763	390.055	405.26	0	405.26	670.202	670.202

48	2.6981	1382.94	42.0055	1) MD silty SAND	100	35	241.456	307.016	295.651	0	295.651	513.101	513.101
49	2.6981	895.162	43.3172	1) MD silty SAND	100	35	172.171	218.919	169.834	0	169.834	332.177	332.177
50	2.6981	336.73	44.6578	1) MD silty SAND	100	35	95.5231	121.459	30.6474	0	30.6474	125.036	125.036

B-B' Existing - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 2.34356

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.24436	37.681	-1.4136	1 No Cohesion	0	35	5.05351	11.8432	16.9139	0	16.9139	16.7892	16.7892
2	2.24436	108.728	-0.595841	1 No Cohesion	0	35	14.5195	34.0273	48.5961	0	48.5961	48.4451	48.4451
3	2.24436	218.098	0.221797	1 No Cohesion	0	35	29.0006	67.9647	97.0635	0	97.0635	97.1758	97.1758
4	2.24436	432.987	1.03948	1 No Cohesion	0	35	57.3303	134.357	191.882	0	191.882	192.923	192.923
5	2.24436	644.374	1.85738	1 No Cohesion	0	35	84.9588	199.106	284.353	0	284.353	287.108	287.108
6	2.24436	847.121	2.67565	1 No Cohesion	0	35	111.22	260.65	372.247	0	372.247	377.445	377.445
7	2.24436	1041.21	3.49447	1 No Cohesion	0	35	136.128	319.023	455.611	0	455.611	463.924	463.924
8	2.39575	1315.72	4.34168	3 No Cohesion	0	44	219.435	514.259	532.529	0	532.529	549.189	549.189
9	2.39575	1516.41	5.21752	3 No Cohesion	0	44	251.36	589.077	610.008	0	610.008	632.961	632.961
10	2.39575	1725.02	6.09458	3 No Cohesion	0	44	284.193	666.024	689.686	0	689.686	720.031	720.031
11	2.39575	1964.88	6.97308	3 No Cohesion	0	44	321.737	754.01	780.799	0	780.799	820.149	820.149
12	2.39575	2195.61	7.85323	3 No Cohesion	0	44	357.328	837.42	867.172	0	867.172	916.459	916.459
13	2.39575	2415.55	8.73525	3 No Cohesion	0	44	390.727	915.692	948.228	0	948.228	1008.26	1008.26
14	2.39575	2624.62	9.61936	3 No Cohesion	0	44	421.956	988.88	1024.01	0	1024.01	1095.53	1095.53
15	2.39575	2822.74	10.5058	3 No Cohesion	0	44	451.036	1057.03	1094.59	0	1094.59	1178.23	1178.23
16	2.39575	3009.82	11.3948	3 No Cohesion	0	44	477.982	1120.18	1159.98	0	1159.98	1256.32	1256.32
17	2.39575	3185.77	12.2865	3 No Cohesion	0	44	502.816	1178.38	1220.25	0	1220.25	1329.76	1329.76
18	2.39575	3350.46	13.1813	3 No Cohesion	0	44	525.547	1231.65	1275.42	0	1275.42	1398.5	1398.5
19	2.39575	3503.79	14.0794	3 No Cohesion	0	44	546.195	1280.04	1325.52	0	1325.52	1462.5	1462.5
20	2.39575	3645.61	14.9811	3 No Cohesion	0	44	564.76	1323.55	1370.57	0	1370.57	1521.7	1521.7
21	2.39575	3775.8	15.8865	3 No Cohesion	0	44	581.257	1362.21	1410.61	0	1410.61	1576.04	1576.04
22	2.39575	3894.19	16.7961	3 No Cohesion	0	44	595.696	1396.05	1445.65	0	1445.65	1625.46	1625.46
23	2.39575	4000.63	17.71	3 No Cohesion	0	44	608.079	1425.07	1475.71	0	1475.71	1669.88	1669.88
24	2.39575	4094.92	18.6286	3 No Cohesion	0	44	618.414	1449.29	1500.78	0	1500.78	1709.25	1709.25
25	2.39575	4176.88	19.5522	3 No Cohesion	0	44	626.696	1468.7	1520.89	0	1520.89	1743.45	1743.45
26	2.39575	4246.3	20.4811	3 No Cohesion	0	44	632.935	1483.32	1536.02	0	1536.02	1772.43	1772.43
27	2.39575	4302.95	21.4157	3 No Cohesion	0	44	637.125	1493.14	1546.19	0	1546.19	1796.08	1796.08
28	2.39575	4335.26	22.3563	3 No Cohesion	0	44	637.594	1494.24	1547.33	0	1547.33	1809.56	1809.56
29	2.39575	4332.79	23.3033	3 No Cohesion	0	44	632.892	1483.22	1535.92	0	1535.92	1808.53	1808.53
30	2.39575	4316.25	24.2571	3 No Cohesion	0	44	626.12	1467.35	1519.49	0	1519.49	1801.63	1801.63
31	2.39575	4285.86	25.2181	3 No Cohesion	0	44	617.351	1446.8	1498.21	0	1498.21	1788.95	1788.95
32	2.39575	4241.31	26.1867	3 No Cohesion	0	44	606.573	1421.54	1472.05	0	1472.05	1770.35	1770.35

33	2.39575	4182.22	27.1635	3 No Cohesion	0	44	593.78	1391.56	1441	0	1441	1745.69	1745.69
34	2.39575	4108.24	28.1489	3 No Cohesion	0	44	578.957	1356.82	1405.03	0	1405.03	1714.8	1714.8
35	2.39575	4018.94	29.1435	3 No Cohesion	0	44	562.098	1317.31	1364.11	0	1364.11	1677.53	1677.53
36	2.34358	3829.94	30.1367	2 No Cohesion	0	40	484.434	1135.3	1353	0	1353	1634.23	1634.23
37	2.34358	3714.23	31.129	2 No Cohesion	0	40	466.564	1093.42	1303.09	0	1303.09	1584.86	1584.86
38	2.34358	3571.58	32.1318	2 No Cohesion	0	40	445.48	1044.01	1244.2	0	1244.2	1523.99	1523.99
39	2.34358	3385.94	33.1457	2 No Cohesion	0	40	419.266	982.574	1170.98	0	1170.98	1444.78	1444.78
40	2.34358	3182.41	34.1715	2 No Cohesion	0	40	391.13	916.637	1092.41	0	1092.41	1357.93	1357.93
41	2.34358	2961.53	35.2099	2 No Cohesion	0	40	361.194	846.479	1008.8	0	1008.8	1263.68	1263.68
42	2.34358	2722.63	36.2618	2 No Cohesion	0	40	329.433	772.047	920.088	0	920.088	1161.74	1161.74
43	2.34358	2464.99	37.3281	2 No Cohesion	0	40	295.824	693.281	826.219	0	826.219	1051.81	1051.81
44	2.34358	2187.79	38.4097	2 No Cohesion	0	40	260.339	610.121	727.116	0	727.116	933.53	933.53
45	2.34358	1890.17	39.5078	2 No Cohesion	0	40	222.952	522.502	622.694	0	622.694	806.533	806.533
46	2.34358	1571.14	40.6235	2 No Cohesion	0	40	183.634	430.357	512.88	0	512.88	670.404	670.404
47	2.13587	1135.35	41.707	1 No Cohesion	0	35	125.424	293.938	419.788	0	419.788	531.564	531.564
48	2.13587	833.833	42.758	1 No Cohesion	0	35	91.3934	214.186	305.889	0	305.889	390.396	390.396
49	2.13587	513.517	43.8272	1 No Cohesion	0	35	55.8245	130.828	186.841	0	186.841	240.426	240.426
50	2.13587	173.825	44.9158	1 No Cohesion	0	35	18.7347	43.9059	62.704	0	62.704	81.3838	81.3838

B-B' Proposed - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 2.77385

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.55233	88.598	-13.3756	1) MD silty SAND	100	35	53.6804	148.901	69.8386	0	69.8386	57.0743	57.0743
2	1.55233	262.267	-12.0456	1) MD silty SAND	100	35	83.1801	230.729	186.7	0	186.7	168.951	168.951
3	1.55233	428.934	-10.7222	1) MD silty SAND	100	35	111.113	308.211	297.356	0	297.356	276.317	276.317
4	1.55233	588.695	-9.4045	1) MD silty SAND	100	35	137.532	381.493	402.013	0	402.013	379.234	379.234
5	1.55233	741.636	-8.09184	1) MD silty SAND	100	35	162.484	450.705	500.859	0	500.859	477.758	477.758
6	1.47918	842.856	-6.81419	3) VD SAND with silt	50	44	225.794	626.318	596.795	0	596.795	569.814	569.814
7	1.47918	969.805	-5.5707	3) VD SAND with silt	50	44	254.936	707.154	680.503	0	680.503	655.638	655.638
8	1.47918	1091.01	-4.32983	3) VD SAND with silt	50	44	282.245	782.906	758.947	0	758.947	737.577	737.577
9	1.47918	1206.49	-3.091	3) VD SAND with silt	50	44	307.773	853.716	832.272	0	832.272	815.652	815.652
10	1.47918	1316.29	-1.85361	3) VD SAND with silt	50	44	331.564	919.709	900.611	0	900.611	889.881	889.881
11	1.47918	1424.41	-0.617088	3) VD SAND with silt	50	44	354.606	983.623	966.793	0	966.793	962.973	962.973
12	1.47918	1544.45	0.619147	3) VD SAND with silt	50	44	380.1	1054.34	1040.02	0	1040.02	1044.13	1044.13
13	1.47918	1660.9	1.85567	3) VD SAND with silt	50	44	404.377	1121.68	1109.75	0	1109.75	1122.85	1122.85
14	1.47918	1771.67	3.09306	3) VD SAND with silt	50	44	426.977	1184.37	1174.67	0	1174.67	1197.74	1197.74
15	1.47918	1876.75	4.3319	3) VD SAND with silt	50	44	447.926	1242.48	1234.85	0	1234.85	1268.78	1268.78
16	1.47918	1976.12	5.57277	3) VD SAND with silt	50	44	467.257	1296.1	1290.37	0	1290.37	1335.96	1335.96
17	1.47918	2069.74	6.81626	3) VD SAND with silt	50	44	484.979	1345.26	1341.28	0	1341.28	1399.25	1399.25
18	1.47918	2157.57	8.063	3) VD SAND with silt	50	44	501.119	1390.03	1387.64	0	1387.64	1458.63	1458.63
19	1.47918	2239.56	9.31359	3) VD SAND with silt	50	44	515.688	1430.44	1429.49	0	1429.49	1514.06	1514.06
20	1.47918	2315.66	10.5687	3) VD SAND with silt	50	44	528.698	1466.53	1466.86	0	1466.86	1565.51	1565.51
21	1.47918	2385.79	11.8289	3) VD SAND with silt	50	44	540.163	1498.33	1499.79	0	1499.79	1612.92	1612.92
22	1.47918	2449.87	13.095	3) VD SAND with silt	50	44	550.084	1525.85	1528.29	0	1528.29	1656.24	1656.24

23	1.47918	2507.83	14.3676	3) VD SAND with silt	50	44	558.469	1549.11	1552.37	0	1552.37	1695.43	1695.43
24	1.47918	2559.55	15.6475	3) VD SAND with silt	50	44	565.319	1568.11	1572.05	0	1572.05	1730.39	1730.39
25	1.47918	2604.92	16.9355	3) VD SAND with silt	50	44	570.633	1582.85	1587.31	0	1587.31	1761.07	1761.07
26	1.47918	2643.82	18.2324	3) VD SAND with silt	50	44	574.407	1593.32	1598.15	0	1598.15	1787.37	1787.37
27	1.47918	2676.11	19.539	3) VD SAND with silt	50	44	576.635	1599.5	1604.55	0	1604.55	1809.19	1809.19
28	1.47918	2701.62	20.8562	3) VD SAND with silt	50	44	577.31	1601.37	1606.5	0	1606.5	1826.44	1826.44
29	1.47918	2720.19	22.1852	3) VD SAND with silt	50	44	576.419	1598.9	1603.94	0	1603.94	1839	1839
30	1.47918	2731.63	23.5268	3) VD SAND with silt	50	44	573.95	1592.05	1596.84	0	1596.84	1846.72	1846.72
31	1.47918	2735.7	24.8822	3) VD SAND with silt	50	44	569.883	1580.77	1585.16	0	1585.16	1849.48	1849.48
32	1.47918	2732.19	26.2527	3) VD SAND with silt	50	44	564.201	1565.01	1568.84	0	1568.84	1847.1	1847.1
33	1.47918	2720.81	27.6396	3) VD SAND with silt	50	44	556.876	1544.69	1547.8	0	1547.8	1839.42	1839.42
34	1.47918	2701.28	29.0443	3) VD SAND with silt	50	44	547.881	1519.74	1521.96	0	1521.96	1826.21	1826.21
35	1.47918	2673.27	30.4684	3) VD SAND with silt	50	44	537.188	1490.08	1491.25	0	1491.25	1807.27	1807.27
36	1.47918	2636.4	31.9137	3) VD SAND with silt	50	44	524.758	1455.6	1455.54	0	1455.54	1782.35	1782.35
37	1.47918	2590.26	33.382	3) VD SAND with silt	50	44	510.554	1416.2	1414.74	0	1414.74	1751.16	1751.16
38	1.47918	2534.38	34.8756	3) VD SAND with silt	50	44	494.526	1371.74	1368.7	0	1368.7	1713.38	1713.38
39	1.47918	2468.23	36.3969	3) VD SAND with silt	50	44	476.63	1322.1	1317.29	0	1317.29	1668.65	1668.65
40	1.47918	2390.15	37.9486	3) VD SAND with silt	50	44	456.607	1266.56	1259.79	0	1259.79	1615.87	1615.87
41	1.47918	2294.53	39.5338	3) VD SAND with silt	50	44	433.509	1202.49	1193.44	0	1193.44	1551.23	1551.23
42	1.47918	2185.59	41.1562	3) VD SAND with silt	50	44	408.212	1132.32	1120.77	0	1120.77	1477.58	1477.58
43	1.47918	2063.35	42.8198	3) VD SAND with silt	50	44	380.81	1056.31	1042.06	0	1042.06	1394.94	1394.94
44	1.47918	1926.72	44.5295	3) VD SAND with silt	50	44	351.22	974.231	957.067	0	957.067	1302.56	1302.56
45	1.47918	1774.4	46.291	3) VD SAND with silt	50	44	319.348	885.823	865.52	0	865.52	1199.59	1199.59
46	1.34212	1464.04	48.024	2) D SAND with silt	50	40	260.437	722.413	801.352	0	801.352	1090.84	1090.84
47	1.34212	1310.31	49.7302	2) D SAND with silt	50	40	230.907	640.5	703.732	0	703.732	976.298	976.298

48	1.34212	1116.08	51.4987	2) D SAND with silt	50	40	195.309	541.758	586.054	0	586.054	831.58	831.58
49	1.34212	758.923	53.3388	2) D SAND with silt	50	40	134.442	372.922	384.843	0	384.843	565.467	565.467
50	1.82018	382.337	55.6253	1) MD silty SAND	100	35	65.0655	180.482	114.94	0	114.94	210.056	210.056

B-B' Proposed - Static

Global Minimum Query (bishop simplified) - Safety Factor: 2.77385

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.55233	88.598	-13.3756	1) MD silty SAND	100	35	53.6804	148.901	69.8386	0	69.8386	57.0743	57.0743
2	1.55233	262.267	-12.0456	1) MD silty SAND	100	35	83.1801	230.729	186.7	0	186.7	168.951	168.951
3	1.55233	428.934	-10.7222	1) MD silty SAND	100	35	111.113	308.211	297.356	0	297.356	276.317	276.317
4	1.55233	588.695	-9.4045	1) MD silty SAND	100	35	137.532	381.493	402.013	0	402.013	379.234	379.234
5	1.55233	741.636	-8.09184	1) MD silty SAND	100	35	162.484	450.705	500.859	0	500.859	477.758	477.758
6	1.47918	842.856	-6.81419	3) VD SAND with silt	50	44	225.794	626.318	596.795	0	596.795	569.814	569.814
7	1.47918	969.805	-5.5707	3) VD SAND with silt	50	44	254.936	707.154	680.503	0	680.503	655.638	655.638
8	1.47918	1091.01	-4.32983	3) VD SAND with silt	50	44	282.245	782.906	758.947	0	758.947	737.577	737.577
9	1.47918	1206.49	-3.091	3) VD SAND with silt	50	44	307.773	853.716	832.272	0	832.272	815.652	815.652
10	1.47918	1316.29	-1.85361	3) VD SAND with silt	50	44	331.564	919.709	900.611	0	900.611	889.881	889.881
11	1.47918	1424.41	-0.617088	3) VD SAND with silt	50	44	354.606	983.623	966.793	0	966.793	962.973	962.973
12	1.47918	1544.45	0.619147	3) VD SAND with silt	50	44	380.1	1054.34	1040.02	0	1040.02	1044.13	1044.13
13	1.47918	1660.9	1.85567	3) VD SAND with silt	50	44	404.377	1121.68	1109.75	0	1109.75	1122.85	1122.85
14	1.47918	1771.67	3.09306	3) VD SAND with silt	50	44	426.977	1184.37	1174.67	0	1174.67	1197.74	1197.74
15	1.47918	1876.75	4.3319	3) VD SAND with silt	50	44	447.926	1242.48	1234.85	0	1234.85	1268.78	1268.78
16	1.47918	1976.12	5.57277	3) VD SAND with silt	50	44	467.257	1296.1	1290.37	0	1290.37	1335.96	1335.96
17	1.47918	2069.74	6.81626	3) VD SAND with silt	50	44	484.979	1345.26	1341.28	0	1341.28	1399.25	1399.25
18	1.47918	2157.57	8.063	3) VD SAND with silt	50	44	501.119	1390.03	1387.64	0	1387.64	1458.63	1458.63
19	1.47918	2239.56	9.31359	3) VD SAND with silt	50	44	515.688	1430.44	1429.49	0	1429.49	1514.06	1514.06
20	1.47918	2315.66	10.5687	3) VD SAND with silt	50	44	528.698	1466.53	1466.86	0	1466.86	1565.51	1565.51
21	1.47918	2385.79	11.8289	3) VD SAND with silt	50	44	540.163	1498.33	1499.79	0	1499.79	1612.92	1612.92
22	1.47918	2449.87	13.095	3) VD SAND with silt	50	44	550.084	1525.85	1528.29	0	1528.29	1656.24	1656.24

23	1.47918	2507.83	14.3676	3) VD SAND with silt	50	44	558.469	1549.11	1552.37	0	1552.37	1695.43	1695.43
24	1.47918	2559.55	15.6475	3) VD SAND with silt	50	44	565.319	1568.11	1572.05	0	1572.05	1730.39	1730.39
25	1.47918	2604.92	16.9355	3) VD SAND with silt	50	44	570.633	1582.85	1587.31	0	1587.31	1761.07	1761.07
26	1.47918	2643.82	18.2324	3) VD SAND with silt	50	44	574.407	1593.32	1598.15	0	1598.15	1787.37	1787.37
27	1.47918	2676.11	19.539	3) VD SAND with silt	50	44	576.635	1599.5	1604.55	0	1604.55	1809.19	1809.19
28	1.47918	2701.62	20.8562	3) VD SAND with silt	50	44	577.31	1601.37	1606.5	0	1606.5	1826.44	1826.44
29	1.47918	2720.19	22.1852	3) VD SAND with silt	50	44	576.419	1598.9	1603.94	0	1603.94	1839	1839
30	1.47918	2731.63	23.5268	3) VD SAND with silt	50	44	573.95	1592.05	1596.84	0	1596.84	1846.72	1846.72
31	1.47918	2735.7	24.8822	3) VD SAND with silt	50	44	569.883	1580.77	1585.16	0	1585.16	1849.48	1849.48
32	1.47918	2732.19	26.2527	3) VD SAND with silt	50	44	564.201	1565.01	1568.84	0	1568.84	1847.1	1847.1
33	1.47918	2720.81	27.6396	3) VD SAND with silt	50	44	556.876	1544.69	1547.8	0	1547.8	1839.42	1839.42
34	1.47918	2701.28	29.0443	3) VD SAND with silt	50	44	547.881	1519.74	1521.96	0	1521.96	1826.21	1826.21
35	1.47918	2673.27	30.4684	3) VD SAND with silt	50	44	537.188	1490.08	1491.25	0	1491.25	1807.27	1807.27
36	1.47918	2636.4	31.9137	3) VD SAND with silt	50	44	524.758	1455.6	1455.54	0	1455.54	1782.35	1782.35
37	1.47918	2590.26	33.382	3) VD SAND with silt	50	44	510.554	1416.2	1414.74	0	1414.74	1751.16	1751.16
38	1.47918	2534.38	34.8756	3) VD SAND with silt	50	44	494.526	1371.74	1368.7	0	1368.7	1713.38	1713.38
39	1.47918	2468.23	36.3969	3) VD SAND with silt	50	44	476.63	1322.1	1317.29	0	1317.29	1668.65	1668.65
40	1.47918	2390.15	37.9486	3) VD SAND with silt	50	44	456.607	1266.56	1259.79	0	1259.79	1615.87	1615.87
41	1.47918	2294.53	39.5338	3) VD SAND with silt	50	44	433.509	1202.49	1193.44	0	1193.44	1551.23	1551.23
42	1.47918	2185.59	41.1562	3) VD SAND with silt	50	44	408.212	1132.32	1120.77	0	1120.77	1477.58	1477.58
43	1.47918	2063.35	42.8198	3) VD SAND with silt	50	44	380.81	1056.31	1042.06	0	1042.06	1394.94	1394.94
44	1.47918	1926.72	44.5295	3) VD SAND with silt	50	44	351.22	974.231	957.067	0	957.067	1302.56	1302.56
45	1.47918	1774.4	46.291	3) VD SAND with silt	50	44	319.348	885.823	865.52	0	865.52	1199.59	1199.59
46	1.34212	1464.04	48.024	2) D SAND with silt	50	40	260.437	722.413	801.352	0	801.352	1090.84	1090.84
47	1.34212	1310.31	49.7302	2) D SAND with silt	50	40	230.907	640.5	703.732	0	703.732	976.298	976.298

48	1.34212	1116.08	51.4987	2) D SAND with silt	50	40	195.309	541.758	586.054	0	586.054	831.58	831.58
49	1.34212	758.923	53.3388	2) D SAND with silt	50	40	134.442	372.922	384.843	0	384.843	565.467	565.467
50	1.82018	382.337	55.6253	1) MD silty SAND	100	35	65.0655	180.482	114.94	0	114.94	210.056	210.056

B-B' Proposed - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.34144

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.59581	135.66	2.25916	1) MD silty SAND	100	35	99.7781	133.846	48.3373	0	48.3373	52.2736	52.2736
2	2.59581	402.601	2.87865	1) MD silty SAND	100	35	151.539	203.281	147.501	0	147.501	155.121	155.121
3	2.59581	660.774	3.49848	1) MD silty SAND	100	35	201.025	269.663	242.303	0	242.303	254.593	254.593
4	2.59581	910.164	4.11871	1) MD silty SAND	100	35	248.266	333.034	332.808	0	332.808	350.685	350.685
5	2.59581	1150.75	4.73943	1) MD silty SAND	100	35	293.295	393.438	419.071	0	419.071	443.388	443.388
6	2.88879	1552.52	5.39581	3) VD SAND with silt	50	44	397.239	532.872	500.03	0	500.03	537.551	537.551
7	2.88879	1869.87	6.088	3) VD SAND with silt	50	44	467.468	627.08	597.586	0	597.586	647.445	647.445
8	2.88879	2222.66	6.78109	3) VD SAND with silt	50	44	544.686	730.663	704.848	0	704.848	769.615	769.615
9	2.88879	2563.2	7.47518	3) VD SAND with silt	50	44	617.849	828.808	806.48	0	806.48	887.549	887.549
10	2.88879	2891.39	8.17037	3) VD SAND with silt	50	44	687.025	921.603	902.57	0	902.57	1001.21	1001.21
11	2.88879	3207.16	8.86677	3) VD SAND with silt	50	44	752.284	1009.14	993.222	0	993.222	1110.58	1110.58
12	2.88879	3510.45	9.5645	3) VD SAND with silt	50	44	813.693	1091.52	1078.52	0	1078.52	1215.63	1215.63
13	2.88879	3801.19	10.2637	3) VD SAND with silt	50	44	871.317	1168.82	1158.57	0	1158.57	1316.34	1316.34
14	2.88879	4079.29	10.9644	3) VD SAND with silt	50	44	925.207	1241.11	1233.43	0	1233.43	1412.68	1412.68
15	2.88879	4344.67	11.6667	3) VD SAND with silt	50	44	975.437	1308.49	1303.2	0	1303.2	1504.61	1504.61
16	2.88879	4597.24	12.3709	3) VD SAND with silt	50	44	1022.04	1371.01	1367.95	0	1367.95	1592.12	1592.12
17	2.88879	4836.88	13.077	3) VD SAND with silt	50	44	1065.09	1428.76	1427.75	0	1427.75	1675.15	1675.15
18	2.88879	5063.5	13.785	3) VD SAND with silt	50	44	1104.62	1481.78	1482.65	0	1482.65	1753.67	1753.67
19	2.88879	5276.98	14.4953	3) VD SAND with silt	50	44	1140.68	1530.15	1532.74	0	1532.74	1827.64	1827.64
20	2.88879	5477.2	15.2078	3) VD SAND with silt	50	44	1173.31	1573.93	1578.07	0	1578.07	1897.03	1897.03
21	2.88879	5663.9	15.9228	3) VD SAND with silt	50	44	1202.54	1613.13	1618.67	0	1618.67	1961.73	1961.73
22	2.88879	5819.5	16.6403	3) VD SAND with silt	50	44	1224.8	1643	1649.6	0	1649.6	2015.67	2015.67

23	2.88879	5948.72	17.3605	3) VD SAND with silt	50	44	1241.24	1665.05	1672.43	0	1672.43	2060.47	2060.47
24	2.88879	6064.09	18.0835	3) VD SAND with silt	50	44	1254.5	1682.83	1690.84	0	1690.84	2100.47	2100.47
25	2.88879	6160.52	18.8095	3) VD SAND with silt	50	44	1263.62	1695.07	1703.52	0	1703.52	2133.92	2133.92
26	2.88879	5709.88	19.5387	3) VD SAND with silt	50	44	1163.8	1561.17	1564.86	0	1564.86	1977.87	1977.87
27	2.88879	4885.07	20.2712	3) VD SAND with silt	50	44	991.777	1330.41	1325.9	0	1325.9	1692.2	1692.2
28	2.88879	4214.44	21.0071	3) VD SAND with silt	50	44	852.576	1143.68	1132.54	0	1132.54	1459.93	1459.93
29	2.88879	3817.55	21.7467	3) VD SAND with silt	50	44	768.599	1031.03	1015.89	0	1015.89	1322.47	1322.47
30	2.88879	3410.52	22.4902	3) VD SAND with silt	50	44	683.971	917.506	898.33	0	898.33	1181.5	1181.5
31	2.88879	2988.23	23.2376	3) VD SAND with silt	50	44	597.758	801.857	778.57	0	778.57	1035.23	1035.23
32	2.77509	2458.61	23.9744	2) D SAND with silt	50	40	463.058	621.165	680.689	0	680.689	886.609	886.609
33	2.77509	2040.6	24.7006	2) D SAND with silt	50	40	386.411	518.347	558.153	0	558.153	735.887	735.887
34	2.77509	1608.35	25.431	2) D SAND with silt	50	40	308.374	413.665	433.4	0	433.4	580.032	580.032
35	2.77509	1429.86	26.1659	2) D SAND with silt	50	40	275.247	369.228	380.443	0	380.443	515.678	515.678
36	2.77509	1033.13	26.9054	2) D SAND with silt	50	40	205.214	275.282	268.48	0	268.48	372.615	372.615
37	2.77509	2334.32	27.6498	2) D SAND with silt	50	40	424.704	569.715	619.373	0	619.373	841.873	841.873
38	2.77509	5796.43	28.3993	2) D SAND with silt	50	40	1004.99	1348.14	1547.07	0	1547.07	2090.45	2090.45
39	2.77509	4994.37	29.1541	2) D SAND with silt	50	40	862.894	1157.52	1319.89	0	1319.89	1801.24	1801.24
40	2.77509	4783.05	29.9146	2) D SAND with silt	50	40	820.894	1101.18	1252.75	0	1252.75	1725.06	1725.06
41	2.77509	4578.29	30.6809	2) D SAND with silt	50	40	780.499	1046.99	1188.17	0	1188.17	1651.24	1651.24
42	2.77509	4311.7	31.4533	2) D SAND with silt	50	40	730.526	979.957	1108.28	0	1108.28	1555.13	1555.13
43	2.77509	3926.25	32.2321	2) D SAND with silt	50	40	662.004	888.038	998.735	0	998.735	1416.14	1416.14
44	2.77509	3519.46	33.0177	2) D SAND with silt	50	40	591.073	792.889	885.341	0	885.341	1269.45	1269.45
45	2.77509	3092.54	33.8104	2) D SAND with silt	50	40	518.028	694.903	768.565	0	768.565	1115.49	1115.49
46	2.77509	2561.92	34.6104	2) D SAND with silt	50	40	429.795	576.544	627.51	0	627.51	924.121	924.121
47	2.77509	1967.25	35.4183	2) D SAND with silt	50	40	333.028	446.737	472.813	0	472.813	709.643	709.643

48	2.40277	1208.13	36.179	1) MD silty SAND	100	35	244.11	327.459	324.845	0	324.845	503.37	503.37
49	2.40277	734.376	36.892	1) MD silty SAND	100	35	168.338	225.815	179.682	0	179.682	306.037	306.037
50	2.40277	247.081	37.6117	1) MD silty SAND	100	35	91.5305	122.783	32.537	0	32.537	103.055	103.055

B-B' Proposed - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 2.62657

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.59581	135.66	2.25916	1 No Cohesion	0	35	13.7871	36.2129	51.7175	0	51.7175	52.2614	52.2614
2	2.59581	402.601	2.87865	1 No Cohesion	0	35	40.7996	107.163	153.045	0	153.045	155.097	155.097
3	2.59581	660.774	3.49848	1 No Cohesion	0	35	66.7726	175.383	250.472	0	250.472	254.554	254.554
4	2.59581	910.164	4.11871	1 No Cohesion	0	35	91.7124	240.889	344.024	0	344.024	350.628	350.628
5	2.59581	1150.75	4.73943	1 No Cohesion	0	35	115.625	303.698	433.725	0	433.725	443.312	443.312
6	2.88879	1552.52	5.39581	3 No Cohesion	0	44	190.961	501.573	519.395	0	519.395	537.432	537.432
7	2.88879	1869.87	6.088	3 No Cohesion	0	44	229.002	601.49	622.861	0	622.861	647.286	647.286
8	2.88879	2222.66	6.78109	3 No Cohesion	0	44	271.034	711.889	737.184	0	737.184	769.412	769.412
9	2.88879	2563.2	7.47518	3 No Cohesion	0	44	311.21	817.415	846.459	0	846.459	887.293	887.293
10	2.88879	2891.39	8.17037	3 No Cohesion	0	44	349.541	918.094	950.713	0	950.713	1000.9	1000.9
11	2.88879	3207.16	8.86677	3 No Cohesion	0	44	386.04	1013.96	1049.99	0	1049.99	1110.21	1110.21
12	2.88879	3510.45	9.5645	3 No Cohesion	0	44	420.72	1105.05	1144.31	0	1144.31	1215.2	1215.2
13	2.88879	3801.19	10.2637	3 No Cohesion	0	44	453.588	1191.38	1233.71	0	1233.71	1315.84	1315.84
14	2.88879	4079.29	10.9644	3 No Cohesion	0	44	484.659	1272.99	1318.22	0	1318.22	1412.11	1412.11
15	2.88879	4344.67	11.6667	3 No Cohesion	0	44	513.94	1349.9	1397.86	0	1397.86	1503.98	1503.98
16	2.88879	4597.24	12.3709	3 No Cohesion	0	44	541.436	1422.12	1472.65	0	1472.65	1591.41	1591.41
17	2.88879	4836.88	13.077	3 No Cohesion	0	44	567.162	1489.69	1542.62	0	1542.62	1674.36	1674.36
18	2.88879	5063.5	13.785	3 No Cohesion	0	44	591.121	1552.62	1607.79	0	1607.79	1752.82	1752.82
19	2.88879	5276.98	14.4953	3 No Cohesion	0	44	613.317	1610.92	1668.15	0	1668.15	1826.71	1826.71
20	2.88879	5477.2	15.2078	3 No Cohesion	0	44	633.754	1664.6	1723.74	0	1723.74	1896.02	1896.02
21	2.88879	5663.9	15.9228	3 No Cohesion	0	44	652.425	1713.64	1774.52	0	1774.52	1960.65	1960.65
22	2.88879	5819.5	16.6403	3 No Cohesion	0	44	667.33	1752.79	1815.07	0	1815.07	2014.52	2014.52
23	2.88879	5948.72	17.3605	3 No Cohesion	0	44	679.057	1783.59	1846.96	0	1846.96	2059.25	2059.25
24	2.88879	6064.09	18.0835	3 No Cohesion	0	44	689.066	1809.88	1874.18	0	1874.18	2099.18	2099.18
25	2.88879	6160.52	18.8095	3 No Cohesion	0	44	696.802	1830.2	1895.22	0	1895.22	2132.56	2132.56
26	2.88879	5709.88	19.5387	3 No Cohesion	0	44	642.835	1688.45	1748.44	0	1748.44	1976.57	1976.57
27	2.88879	4885.07	20.2712	3 No Cohesion	0	44	547.398	1437.78	1488.87	0	1488.87	1691.05	1691.05
28	2.88879	4214.44	21.0071	3 No Cohesion	0	44	470.02	1234.54	1278.4	0	1278.4	1458.9	1458.9
29	2.88879	3817.55	21.7467	3 No Cohesion	0	44	423.724	1112.94	1152.48	0	1152.48	1321.5	1321.5
30	2.88879	3410.52	22.4902	3 No Cohesion	0	44	376.721	989.483	1024.64	0	1024.64	1180.61	1180.61
31	2.88879	2988.23	23.2376	3 No Cohesion	0	44	328.464	862.735	893.389	0	893.389	1034.42	1034.42
32	2.77509	2458.61	23.9744	2 No Cohesion	0	40	247.826	650.932	775.75	0	775.75	885.957	885.957

33	2.77509	2040.6	24.7006	2 No Cohesion	0	40	204.816	537.963	641.121	0	641.121	735.328	735.328
34	2.77509	1608.35	25.431	2 No Cohesion	0	40	160.735	422.183	503.137	0	503.137	579.567	579.567
35	2.77509	1429.86	26.1659	2 No Cohesion	0	40	142.273	373.691	445.347	0	445.347	515.249	515.249
36	2.77509	1033.13	26.9054	2 No Cohesion	0	40	102.342	268.808	320.353	0	320.353	372.286	372.286
37	2.77509	2334.32	27.6498	2 No Cohesion	0	40	230.198	604.63	720.571	0	720.571	841.17	841.17
38	2.77509	5796.43	28.3993	2 No Cohesion	0	40	568.997	1494.51	1781.09	0	1781.09	2088.74	2088.74
39	2.77509	4994.37	29.1541	2 No Cohesion	0	40	487.986	1281.73	1527.5	0	1527.5	1799.72	1799.72
40	2.77509	4783.05	29.9146	2 No Cohesion	0	40	465.128	1221.69	1455.95	0	1455.95	1723.57	1723.57
41	2.77509	4578.29	30.6809	2 No Cohesion	0	40	443.068	1163.75	1386.91	0	1386.91	1649.78	1649.78
42	2.77509	4311.7	31.4533	2 No Cohesion	0	40	415.222	1090.61	1299.73	0	1299.73	1553.72	1553.72
43	2.77509	3926.25	32.2321	2 No Cohesion	0	40	376.208	988.137	1177.62	0	1177.62	1414.82	1414.82
44	2.77509	3519.46	33.0177	2 No Cohesion	0	40	335.506	881.229	1050.21	0	1050.21	1268.24	1268.24
45	2.77509	3092.54	33.8104	2 No Cohesion	0	40	293.267	770.287	917.993	0	917.993	1114.4	1114.4
46	2.77509	2561.92	34.6104	2 No Cohesion	0	40	241.65	634.71	756.418	0	756.418	923.186	923.186
47	2.77509	1967.25	35.4183	2 No Cohesion	0	40	184.543	484.714	577.66	0	577.66	708.896	708.896
48	2.40277	1208.13	36.179	1 No Cohesion	0	35	112.172	294.627	420.773	0	420.773	502.807	502.807
49	2.40277	734.376	36.892	1 No Cohesion	0	35	67.8931	178.326	254.676	0	254.676	305.637	305.637
50	2.40277	247.081	37.6117	1 No Cohesion	0	35	22.7426	59.735	85.3104	0	85.3104	102.832	102.832

Interslice Data

A-A" Existing - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 1.90718

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	119.614	339.722	0	0	0
2	121.012	339.631	98.8533	0	0
3	122.41	339.564	239.914	0	0
4	123.807	339.521	417.467	0	0
5	125.205	339.502	626.128	0	0
6	126.603	339.507	860.819	0	0
7	128	339.536	1116.76	0	0
8	129.398	339.589	1389.44	0	0
9	130.796	339.665	1674.62	0	0
10	132.193	339.766	1968.33	0	0
11	133.591	339.891	2266.83	0	0
12	134.989	340.041	2566.63	0	0
13	136.386	340.214	2864.45	0	0
14	137.846	340.422	3204.53	0	0
15	139.306	340.656	3539.28	0	0
16	140.766	340.918	3865.38	0	0
17	142.225	341.207	4185.8	0	0
18	143.685	341.524	4506.65	0	0
19	145.145	341.869	4822.68	0	0
20	146.604	342.242	5128.71	0	0
21	148.064	342.645	5419.77	0	0
22	149.524	343.077	5691.2	0	0
23	150.983	343.538	5938.52	0	0
24	152.443	344.03	6157.53	0	0
25	153.903	344.553	6344.26	0	0
26	155.363	345.107	6494.98	0	0
27	156.822	345.694	6606.19	0	0
28	158.282	346.314	6674.65	0	0
29	159.742	346.967	6697.36	0	0
30	161.201	347.656	6671.57	0	0
31	162.661	348.38	6594.8	0	0
32	164.121	349.141	6464.84	0	0
33	165.58	349.94	6279.77	0	0
34	167.04	350.778	6037.97	0	0
35	168.5	351.657	5738.16	0	0
36	169.959	352.578	5379.4	0	0
37	171.419	353.543	4961.12	0	0
38	172.879	354.554	4483.19	0	0
39	174.339	355.613	3952.6	0	0
40	175.798	356.723	3381.79	0	0
41	177.258	357.886	2775.77	0	0
42	178.718	359.104	2142.93	0	0
43	180.177	360.382	1508.09	0	0
44	181.649	361.735	794.218	0	0
45	183.122	363.157	121.81	0	0
46	184.594	364.652	-492.167	0	0
47	186.066	366.228	-1028.31	0	0
48	187.538	367.891	-1464.25	0	0
49	189.01	369.649	-1774.01	0	0
50	190.482	371.513	-1927.12	0	0
51	191.954	373.495	0	0	0

A-A" Existing - Static

Global Minimum Query (bishop simplified) - Safety Factor: 1.90718

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	119.614	339.722	0	0	0
2	121.012	339.631	98.8533	0	0
3	122.41	339.564	239.914	0	0
4	123.807	339.521	417.467	0	0
5	125.205	339.502	626.128	0	0
6	126.603	339.507	860.819	0	0
7	128	339.536	1116.76	0	0
8	129.398	339.589	1389.44	0	0
9	130.796	339.665	1674.62	0	0
10	132.193	339.766	1968.33	0	0
11	133.591	339.891	2266.83	0	0
12	134.989	340.041	2566.63	0	0
13	136.386	340.214	2864.45	0	0
14	137.846	340.422	3204.53	0	0
15	139.306	340.656	3539.28	0	0
16	140.766	340.918	3865.38	0	0
17	142.225	341.207	4185.8	0	0
18	143.685	341.524	4506.65	0	0
19	145.145	341.869	4822.68	0	0
20	146.604	342.242	5128.71	0	0
21	148.064	342.645	5419.77	0	0
22	149.524	343.077	5691.2	0	0
23	150.983	343.538	5938.52	0	0
24	152.443	344.03	6157.53	0	0
25	153.903	344.553	6344.26	0	0
26	155.363	345.107	6494.98	0	0
27	156.822	345.694	6606.19	0	0
28	158.282	346.314	6674.65	0	0
29	159.742	346.967	6697.36	0	0
30	161.201	347.656	6671.57	0	0
31	162.661	348.38	6594.8	0	0
32	164.121	349.141	6464.84	0	0
33	165.58	349.94	6279.77	0	0
34	167.04	350.778	6037.97	0	0
35	168.5	351.657	5738.16	0	0
36	169.959	352.578	5379.4	0	0
37	171.419	353.543	4961.12	0	0
38	172.879	354.554	4483.19	0	0
39	174.339	355.613	3952.6	0	0
40	175.798	356.723	3381.79	0	0
41	177.258	357.886	2775.77	0	0
42	178.718	359.104	2142.93	0	0
43	180.177	360.382	1508.09	0	0
44	181.649	361.735	794.218	0	0
45	183.122	363.157	121.81	0	0
46	184.594	364.652	-492.167	0	0
47	186.066	366.228	-1028.31	0	0
48	187.538	367.891	-1464.25	0	0
49	189.01	369.649	-1774.01	0	0
50	190.482	371.513	-1927.12	0	0
51	191.954	373.495	0	0	0

A-A" Existing - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.04524

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	111.264	336.489	0	0	0
2	113.039	336.647	174.293	0	0
3	114.814	336.825	370.381	0	0
4	116.589	337.023	584.295	0	0
5	118.364	337.242	812.294	0	0
6	120.139	337.48	1050.86	0	0
7	121.915	337.74	1296.7	0	0
8	123.69	338.019	1546.71	0	0
9	125.465	338.32	1798.02	0	0
10	127.24	338.641	2047.94	0	0
11	129.015	338.983	2293.98	0	0
12	130.79	339.346	2533.87	0	0
13	132.565	339.731	2765.5	0	0
14	134.34	340.136	2986.96	0	0
15	136.116	340.564	3196.53	0	0
16	137.891	341.013	3392.68	0	0
17	139.666	341.484	3574.06	0	0
18	141.481	341.988	3793.33	0	0
19	143.296	342.516	4005.66	0	0
20	145.111	343.067	4209.78	0	0
21	146.927	343.642	4401.23	0	0
22	148.742	344.241	4575.77	0	0
23	150.557	344.865	4729.41	0	0
24	152.372	345.513	4858.39	0	0
25	154.188	346.187	4959.16	0	0
26	156.003	346.885	5028.4	0	0
27	157.818	347.61	5063.04	0	0
28	159.633	348.36	5060.2	0	0
29	161.449	349.138	5017.26	0	0
30	163.264	349.942	4931.79	0	0
31	165.079	350.773	4801.61	0	0
32	166.894	351.632	4624.77	0	0
33	168.71	352.52	4399.55	0	0
34	170.525	353.437	4124.46	0	0
35	172.34	354.383	3798.25	0	0
36	174.155	355.359	3423.1	0	0
37	175.97	356.366	3011.36	0	0
38	177.786	357.405	2566.66	0	0
39	179.601	358.475	2099.86	0	0
40	181.416	359.579	1628.71	0	0
41	183.231	360.716	1159.98	0	0
42	185.092	361.917	563.182	0	0
43	186.952	363.156	5.1949	0	0
44	188.813	364.433	-504.925	0	0
45	190.673	365.749	-957.603	0	0
46	192.534	367.107	-1342.7	0	0
47	194.394	368.506	-1649.48	0	0
48	196.255	369.949	-1866.53	0	0
49	198.115	371.437	-1981.76	0	0
50	199.976	372.971	-1982.28	0	0
51	201.836	374.554	0	0	0

A-A" Existing - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 1.73395

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	124.079	341.45	0	0	0
2	125.481	341.349	26.4997	0	0
3	126.884	341.274	101.25	0	0
4	128.287	341.225	217.547	0	0
5	129.689	341.203	369.104	0	0
6	131.092	341.206	550.024	0	0
7	132.495	341.236	754.78	0	0
8	133.897	341.292	978.192	0	0
9	135.3	341.374	1215.41	0	0
10	136.703	341.482	1461.89	0	0
11	138.105	341.617	1713.41	0	0
12	139.508	341.778	1966.02	0	0
13	140.911	341.965	2216.04	0	0
14	142.276	342.174	2535.06	0	0
15	143.641	342.408	2867.06	0	0
16	145.006	342.668	3206.45	0	0
17	146.371	342.955	3547.88	0	0
18	147.736	343.268	3886.2	0	0
19	149.102	343.607	4216.56	0	0
20	150.467	343.974	4534.29	0	0
21	151.832	344.369	4834.98	0	0
22	153.197	344.792	5114.44	0	0
23	154.562	345.243	5368.68	0	0
24	155.928	345.724	5593.95	0	0
25	157.293	346.234	5786.68	0	0
26	158.658	346.775	5943.55	0	0
27	160.023	347.346	6061.43	0	0
28	161.388	347.95	6137.41	0	0
29	162.753	348.586	6168.81	0	0
30	164.119	349.256	6153.18	0	0
31	165.484	349.961	6088.28	0	0
32	166.849	350.701	5972.15	0	0
33	168.214	351.479	5803.06	0	0
34	169.579	352.295	5579.58	0	0
35	170.945	353.15	5300.53	0	0
36	172.31	354.047	4965.1	0	0
37	173.675	354.988	4574	0	0
38	175.04	355.973	4136.04	0	0
39	176.405	357.006	3655.79	0	0
40	177.77	358.089	3137.16	0	0
41	179.136	359.225	2590.35	0	0
42	180.501	360.418	2033.36	0	0
43	181.789	361.597	1377	0	0
44	183.077	362.834	739.903	0	0
45	184.366	364.131	133.236	0	0
46	185.654	365.493	-430.332	0	0
47	186.942	366.926	-936.37	0	0
48	188.231	368.436	-1368.31	0	0
49	189.519	370.03	-1707	0	0
50	190.807	371.718	-1930.05	0	0
51	192.096	373.51	0	0	0

A-A' Proposed - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 2.39056

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	63.6731	326.304	0	0	0
2	65.1287	326.122	81.0619	0	0
3	66.5844	325.964	192.198	0	0
4	68.04	325.831	328.762	0	0
5	69.4957	325.723	486.431	0	0
6	70.9514	325.639	661.193	0	0
7	72.407	325.581	849.326	0	0
8	73.8627	325.546	1047.39	0	0
9	75.3183	325.536	1252.21	0	0
10	76.774	325.551	1460.88	0	0
11	78.2296	325.59	1670.72	0	0
12	79.6853	325.654	1879.32	0	0
13	81.141	325.742	2084.48	0	0
14	82.5469	325.851	2316.43	0	0
15	83.9529	325.983	2543.62	0	0
16	85.3589	326.138	3239.06	0	0
17	86.7649	326.316	3900.88	0	0
18	88.1709	326.518	4507.14	0	0
19	89.5769	326.743	5033.15	0	0
20	90.9828	326.993	5523.44	0	0
21	92.3888	327.266	5977.07	0	0
22	93.7948	327.564	6395.19	0	0
23	95.2008	327.886	6784.86	0	0
24	96.6957	328.256	6950.78	0	0
25	98.1905	328.654	7074.19	0	0
26	99.6854	329.081	7152.78	0	0
27	101.18	329.537	7184.51	0	0
28	102.675	330.023	7167.56	0	0
29	104.17	330.539	7100.33	0	0
30	105.665	331.087	6981.46	0	0
31	107.16	331.665	6809.82	0	0
32	108.655	332.276	6584.53	0	0
33	110.15	332.92	6304.98	0	0
34	111.644	333.598	5970.77	0	0
35	113.139	334.31	5586.32	0	0
36	114.634	335.058	5165.03	0	0
37	116.129	335.843	4711.82	0	0
38	117.624	336.665	4231.62	0	0
39	119.119	337.527	3729.88	0	0
40	120.614	338.428	3212.61	0	0
41	122.109	339.372	2686.41	0	0
42	123.603	340.36	2158.59	0	0
43	125.098	341.392	1637.21	0	0
44	126.643	342.509	1092.72	0	0
45	128.188	343.68	569.817	0	0
46	129.733	344.906	80.3945	0	0
47	131.278	346.191	-362.264	0	0
48	132.822	347.538	-743.254	0	0
49	134.367	348.953	-1045.8	0	0
50	135.912	350.438	-1250.92	0	0
51	137.457	352	0	0	0

A-A' Proposed - Static

Global Minimum Query (bishop simplified) - Safety Factor: 2.39056

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	63.6731	326.304	0	0	0
2	65.1287	326.122	81.0619	0	0
3	66.5844	325.964	192.198	0	0
4	68.04	325.831	328.762	0	0
5	69.4957	325.723	486.431	0	0
6	70.9514	325.639	661.193	0	0
7	72.407	325.581	849.326	0	0
8	73.8627	325.546	1047.39	0	0
9	75.3183	325.536	1252.21	0	0
10	76.774	325.551	1460.88	0	0
11	78.2296	325.59	1670.72	0	0
12	79.6853	325.654	1879.32	0	0
13	81.141	325.742	2084.48	0	0
14	82.5469	325.851	2316.43	0	0
15	83.9529	325.983	2543.62	0	0
16	85.3589	326.138	3239.06	0	0
17	86.7649	326.316	3900.88	0	0
18	88.1709	326.518	4507.14	0	0
19	89.5769	326.743	5033.15	0	0
20	90.9828	326.993	5523.44	0	0
21	92.3888	327.266	5977.07	0	0
22	93.7948	327.564	6395.19	0	0
23	95.2008	327.886	6784.86	0	0
24	96.6957	328.256	6950.78	0	0
25	98.1905	328.654	7074.19	0	0
26	99.6854	329.081	7152.78	0	0
27	101.18	329.537	7184.51	0	0
28	102.675	330.023	7167.56	0	0
29	104.17	330.539	7100.33	0	0
30	105.665	331.087	6981.46	0	0
31	107.16	331.665	6809.82	0	0
32	108.655	332.276	6584.53	0	0
33	110.15	332.92	6304.98	0	0
34	111.644	333.598	5970.77	0	0
35	113.139	334.31	5586.32	0	0
36	114.634	335.058	5165.03	0	0
37	116.129	335.843	4711.82	0	0
38	117.624	336.665	4231.62	0	0
39	119.119	337.527	3729.88	0	0
40	120.614	338.428	3212.61	0	0
41	122.109	339.372	2686.41	0	0
42	123.603	340.36	2158.59	0	0
43	125.098	341.392	1637.21	0	0
44	126.643	342.509	1092.72	0	0
45	128.188	343.68	569.817	0	0
46	129.733	344.906	80.3945	0	0
47	131.278	346.191	-362.264	0	0
48	132.822	347.538	-743.254	0	0
49	134.367	348.953	-1045.8	0	0
50	135.912	350.438	-1250.92	0	0
51	137.457	352	0	0	0

A-A' Proposed - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.15844

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	62.4107	326.075	0	0	0
2	64.0665	325.972	163.874	0	0
3	65.7222	325.892	352.671	0	0
4	67.3779	325.835	561.831	0	0
5	69.0336	325.802	787.154	0	0
6	70.6893	325.792	1024.78	0	0
7	72.345	325.805	1271.18	0	0
8	74.0008	325.841	1523.13	0	0
9	75.6565	325.9	1777.72	0	0
10	77.3122	325.983	2032.29	0	0
11	78.9679	326.089	2284.49	0	0
12	80.6236	326.218	2532.24	0	0
13	82.2793	326.37	2773.7	0	0
14	83.9351	326.547	3007.28	0	0
15	85.5908	326.746	3486	0	0
16	87.2465	326.97	3923.55	0	0
17	88.9022	327.217	4300.26	0	0
18	90.5579	327.488	4627.11	0	0
19	92.2136	327.784	4914	0	0
20	93.8694	328.104	5161.31	0	0
21	95.5251	328.448	5370.71	0	0
22	97.1808	328.817	5539.85	0	0
23	98.8365	329.212	5666.21	0	0
24	100.492	329.631	5747.64	0	0
25	102.148	330.076	5782.2	0	0
26	103.804	330.548	5768.2	0	0
27	105.459	331.045	5704.16	0	0
28	107.115	331.568	5588.84	0	0
29	108.771	332.119	5421.21	0	0
30	110.427	332.697	5200.48	0	0
31	112.082	333.303	4926.01	0	0
32	113.738	333.937	4606.74	0	0
33	115.394	334.599	4253.09	0	0
34	117.049	335.291	3868.87	0	0
35	118.705	336.013	3458.19	0	0
36	120.361	336.765	3025.4	0	0
37	122.017	337.548	2575.16	0	0
38	123.672	338.362	2112.43	0	0
39	125.328	339.21	1642.49	0	0
40	126.984	340.09	1170.98	0	0
41	128.639	341.004	703.875	0	0
42	130.295	341.954	247.581	0	0
43	131.951	342.939	-191.098	0	0
44	133.607	343.962	-604.901	0	0
45	135.262	345.022	-986.077	0	0
46	136.863	346.085	-1391.16	0	0
47	138.464	347.187	-1746.89	0	0
48	140.065	348.327	-2042.31	0	0
49	141.666	349.508	-2267.22	0	0
50	143.267	350.732	-2410.76	0	0
51	144.868	352	0	0	0

A-A' Proposed - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 2.12532

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	54.4937	325.062	0	0	0
2	56.9926	324.982	21.4168	0	0
3	59.4916	324.938	81.0625	0	0
4	61.9905	324.929	171.953	0	0
5	64.4894	324.954	294.355	0	0
6	66.9883	325.014	448.181	0	0
7	69.4872	325.11	626.719	0	0
8	71.9861	325.24	823.763	0	0
9	74.4851	325.406	1033.6	0	0
10	76.984	325.606	1251.02	0	0
11	79.4829	325.842	1471.27	0	0
12	81.9818	326.114	1690.07	0	0
13	84.4807	326.421	2023.16	0	0
14	86.9796	326.764	2788.83	0	0
15	89.4786	327.143	3446.37	0	0
16	91.9775	327.558	4029.87	0	0
17	94.4764	328.01	4567.52	0	0
18	96.9753	328.498	5075.98	0	0
19	99.4742	329.024	5548.85	0	0
20	101.973	329.587	5978.87	0	0
21	104.472	330.187	6359.48	0	0
22	106.971	330.826	6684.58	0	0
23	109.47	331.504	6948.49	0	0
24	111.969	332.221	7146.01	0	0
25	114.468	332.977	7269.14	0	0
26	116.967	333.773	7316.05	0	0
27	119.466	334.61	7290.76	0	0
28	121.964	335.488	7197.83	0	0
29	124.463	336.409	7042.36	0	0
30	126.962	337.371	6830.01	0	0
31	129.461	338.377	6567.04	0	0
32	131.96	339.428	6260.32	0	0
33	134.459	340.523	5917.38	0	0
34	136.958	341.664	5547.26	0	0
35	139.457	342.852	5168.48	0	0
36	141.956	344.088	4797.3	0	0
37	144.455	345.374	4447.97	0	0
38	146.954	346.709	4129.22	0	0
39	149.453	348.096	3786.16	0	0
40	151.952	349.536	3402.85	0	0
41	154.45	351.03	2980.75	0	0
42	156.949	352.58	2522.18	0	0
43	159.448	354.189	2030.39	0	0
44	161.947	355.857	1509.63	0	0
45	164.446	357.586	965.227	0	0
46	166.945	359.38	421.327	0	0
47	169.444	361.24	-70.6048	0	0
48	171.943	363.169	-492.621	0	0
49	174.442	365.17	-826.34	0	0
50	176.941	367.245	-1051.31	0	0
51	179.44	369.4	0	0	0

B-B' Existing - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 2.50286

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	11.715	314.643	0	0	0
2	14.009	314.621	127.128	0	0
3	16.303	314.634	317.051	0	0
4	18.5969	314.681	559.664	0	0
5	20.8909	314.764	845.401	0	0
6	23.1849	314.881	1165.22	0	0
7	25.4373	315.029	1581.11	0	0
8	27.6897	315.212	2036.26	0	0
9	29.9421	315.428	2532.41	0	0
10	32.1946	315.679	3060.48	0	0
11	34.447	315.963	3611.36	0	0
12	36.6994	316.282	4176.41	0	0
13	38.9518	316.635	4747.43	0	0
14	41.2042	317.024	5316.69	0	0
15	43.4566	317.447	5876.85	0	0
16	45.709	317.905	6421.05	0	0
17	47.9614	318.4	6942.79	0	0
18	50.2139	318.93	7436.04	0	0
19	52.4663	319.497	7895.14	0	0
20	54.7187	320.101	8314.87	0	0
21	56.9711	320.742	8690.39	0	0
22	59.2235	321.421	9017.3	0	0
23	61.4759	322.138	9291.6	0	0
24	63.7283	322.895	9509.7	0	0
25	65.9807	323.691	9668.46	0	0
26	68.2332	324.527	9765.15	0	0
27	70.4856	325.404	9797.52	0	0
28	72.738	326.322	9764.37	0	0
29	74.9904	327.284	9665.3	0	0
30	77.2428	328.289	9500.43	0	0
31	79.4952	329.338	9270.39	0	0
32	81.7476	330.432	8976.35	0	0
33	84	331.573	8620.08	0	0
34	86.2525	332.762	8203.97	0	0
35	88.5049	334	7731.04	0	0
36	90.7141	335.263	7046.03	0	0
37	92.9234	336.576	6317.68	0	0
38	95.1327	337.94	5555.32	0	0
39	97.342	339.358	4770.61	0	0
40	99.5513	340.83	3972.16	0	0
41	101.761	342.359	3169.61	0	0
42	103.97	343.948	2373.74	0	0
43	106.179	345.597	1596.6	0	0
44	108.388	347.31	851.626	0	0
45	110.598	349.09	153.825	0	0
46	112.807	350.94	-480.069	0	0
47	115.016	352.863	-1031.37	0	0
48	117.103	354.75	-1463.17	0	0
49	119.19	356.709	-1763.92	0	0
50	121.277	358.744	-1909.77	0	0
51	123.363	360.859	0	0	0

B-B' Existing - Static

Global Minimum Query (bishop simplified) - Safety Factor: 2.50286

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	11.715	314.643	0	0	0
2	14.009	314.621	127.128	0	0
3	16.303	314.634	317.051	0	0
4	18.5969	314.681	559.664	0	0
5	20.8909	314.764	845.401	0	0
6	23.1849	314.881	1165.22	0	0
7	25.4373	315.029	1581.11	0	0
8	27.6897	315.212	2036.26	0	0
9	29.9421	315.428	2532.41	0	0
10	32.1946	315.679	3060.48	0	0
11	34.447	315.963	3611.36	0	0
12	36.6994	316.282	4176.41	0	0
13	38.9518	316.635	4747.43	0	0
14	41.2042	317.024	5316.69	0	0
15	43.4566	317.447	5876.85	0	0
16	45.709	317.905	6421.05	0	0
17	47.9614	318.4	6942.79	0	0
18	50.2139	318.93	7436.04	0	0
19	52.4663	319.497	7895.14	0	0
20	54.7187	320.101	8314.87	0	0
21	56.9711	320.742	8690.39	0	0
22	59.2235	321.421	9017.3	0	0
23	61.4759	322.138	9291.6	0	0
24	63.7283	322.895	9509.7	0	0
25	65.9807	323.691	9668.46	0	0
26	68.2332	324.527	9765.15	0	0
27	70.4856	325.404	9797.52	0	0
28	72.738	326.322	9764.37	0	0
29	74.9904	327.284	9665.3	0	0
30	77.2428	328.289	9500.43	0	0
31	79.4952	329.338	9270.39	0	0
32	81.7476	330.432	8976.35	0	0
33	84	331.573	8620.08	0	0
34	86.2525	332.762	8203.97	0	0
35	88.5049	334	7731.04	0	0
36	90.7141	335.263	7046.03	0	0
37	92.9234	336.576	6317.68	0	0
38	95.1327	337.94	5555.32	0	0
39	97.342	339.358	4770.61	0	0
40	99.5513	340.83	3972.16	0	0
41	101.761	342.359	3169.61	0	0
42	103.97	343.948	2373.74	0	0
43	106.179	345.597	1596.6	0	0
44	108.388	347.31	851.626	0	0
45	110.598	349.09	153.825	0	0
46	112.807	350.94	-480.069	0	0
47	115.016	352.863	-1031.37	0	0
48	117.103	354.75	-1463.17	0	0
49	119.19	356.709	-1763.92	0	0
50	121.277	358.744	-1909.77	0	0
51	123.363	360.859	0	0	0

B-B' Existing - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.27152

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	12.0356	314.763	0	0	0
2	14.3246	314.747	208.691	0	0
3	16.6136	314.764	465.118	0	0
4	18.9026	314.813	758.985	0	0
5	21.1916	314.895	1080.66	0	0
6	23.4806	315.01	1421.17	0	0
7	25.7909	315.159	1921.53	0	0
8	28.1013	315.342	2465.44	0	0
9	30.4116	315.558	3051.81	0	0
10	32.7219	315.808	3669	0	0
11	35.0323	316.092	4306.01	0	0
12	37.3426	316.41	4952.58	0	0
13	39.6529	316.763	5599.07	0	0
14	41.9633	317.15	6236.55	0	0
15	44.2736	317.572	6856.67	0	0
16	46.584	318.03	7451.69	0	0
17	48.8943	318.522	8014.48	0	0
18	51.2046	319.051	8538.44	0	0
19	53.515	319.615	9017.57	0	0
20	55.8253	320.216	9446.38	0	0
21	58.1357	320.854	9819.92	0	0
22	60.446	321.53	10133.8	0	0
23	62.7563	322.243	10384	0	0
24	65.0667	322.995	10567.3	0	0
25	67.377	323.786	10680.8	0	0
26	69.6873	324.616	10722.1	0	0
27	71.9977	325.487	10689.9	0	0
28	74.308	326.399	10584.2	0	0
29	76.6184	327.352	10405.1	0	0
30	78.9287	328.348	10153.5	0	0
31	81.239	329.388	9830.56	0	0
32	83.5494	330.472	9438.3	0	0
33	85.8597	331.601	8979.19	0	0
34	88.1701	332.777	8456.3	0	0
35	90.4804	334	7873.34	0	0
36	92.7688	335.26	6971.99	0	0
37	95.0571	336.569	6031.98	0	0
38	97.3455	337.929	5066.29	0	0
39	99.6338	339.341	4083.37	0	0
40	101.922	340.807	3092.47	0	0
41	104.211	342.329	2103.78	0	0
42	106.499	343.908	1128.42	0	0
43	108.787	345.547	178.62	0	0
44	111.076	347.248	-732.245	0	0
45	113.364	349.013	-1589.53	0	0
46	115.652	350.845	-2377.22	0	0
47	117.941	352.748	-3077.72	0	0
48	120.229	354.725	-3671.79	0	0
49	122.927	357.155	-4185.62	0	0
50	125.625	359.699	-4442.55	0	0
51	128.323	362.365	0	0	0

B-B' Existing - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 2.34356

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	4.95379	313.495	0	0	0
2	7.19815	313.44	12.2785	0	0
3	9.44251	313.417	45.9993	0	0
4	11.6869	313.425	110.243	0	0
5	13.9312	313.466	231.097	0	0
6	16.1756	313.539	401.077	0	0
7	18.4199	313.644	611.648	0	0
8	20.6643	313.781	854.719	0	0
9	23.0601	313.963	1283.56	0	0
10	25.4558	314.181	1752.3	0	0
11	27.8516	314.437	2256.72	0	0
12	30.2473	314.73	2798.72	0	0
13	32.6431	315.061	3368.23	0	0
14	35.0388	315.429	3955.25	0	0
15	37.4346	315.835	4550.34	0	0
16	39.8303	316.279	5144.6	0	0
17	42.2261	316.762	5729.62	0	0
18	44.6218	317.284	6297.54	0	0
19	47.0176	317.845	6840.98	0	0
20	49.4133	318.446	7353.06	0	0
21	51.8091	319.087	7827.4	0	0
22	54.2048	319.769	8258.12	0	0
23	56.6006	320.492	8639.83	0	0
24	58.9963	321.257	8967.64	0	0
25	61.3921	322.064	9237.17	0	0
26	63.7879	322.915	9444.53	0	0
27	66.1836	323.81	9586.38	0	0
28	68.5794	324.75	9659.88	0	0
29	70.9751	325.735	9662.76	0	0
30	73.3709	326.767	9594.02	0	0
31	75.7666	327.847	9453.65	0	0
32	78.1624	328.975	9242.26	0	0
33	80.5581	330.153	8961.12	0	0
34	82.9539	331.382	8612.19	0	0
35	85.3496	332.664	8198.19	0	0
36	87.7454	334	7722.58	0	0
37	90.089	335.361	7017.07	0	0
38	92.4325	336.776	6266.15	0	0
39	94.7761	338.248	5478.77	0	0
40	97.1197	339.778	4669.23	0	0
41	99.4633	341.369	3847.86	0	0
42	101.807	343.023	3025.97	0	0
43	104.15	344.742	2216.26	0	0
44	106.494	346.529	1432.96	0	0
45	108.838	348.387	691.992	0	0
46	111.181	350.32	11.1779	0	0
47	113.525	352.33	-589.539	0	0
48	115.661	354.234	-1120.7	0	0
49	117.797	356.209	-1529.61	0	0
50	119.932	358.259	-1793.44	0	0
51	122.068	360.388	0	0	0

B-B' Proposed - Master Scenario

Global Minimum Query (bishop simplified) - Safety Factor: 2.77385

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	10.2235	314.084	0	0	0
2	11.7759	313.715	109.107	0	0
3	13.3282	313.383	300.072	0	0
4	14.8805	313.09	559.957	0	0
5	16.4328	312.832	876.81	0	0
6	17.9852	312.612	1239.58	0	0
7	19.4643	312.435	1679.04	0	0
8	20.9435	312.291	2154.31	0	0
9	22.4227	312.179	2656.79	0	0
10	23.9019	312.099	3178.51	0	0
11	25.381	312.051	3712.06	0	0
12	26.8602	312.035	4251.98	0	0
13	28.3394	312.051	4797.58	0	0
14	29.8186	312.099	5342.53	0	0
15	31.2977	312.179	5880.21	0	0
16	32.7769	312.291	6404.4	0	0
17	34.2561	312.435	6909.31	0	0
18	35.7353	312.612	7389.52	0	0
19	37.2145	312.822	7839.98	0	0
20	38.6936	313.064	8255.99	0	0
21	40.1728	313.34	8633.19	0	0
22	41.652	313.65	8967.54	0	0
23	43.1312	313.994	9255.35	0	0
24	44.6103	314.373	9493.22	0	0
25	46.0895	314.787	9678.09	0	0
26	47.5687	315.238	9807.2	0	0
27	49.0479	315.725	9878.13	0	0
28	50.527	316.25	9888.78	0	0
29	52.0062	316.813	9837.37	0	0
30	53.4854	317.417	9722.5	0	0
31	54.9646	318.061	9543.12	0	0
32	56.4437	318.747	9298.56	0	0
33	57.9229	319.476	8988.57	0	0
34	59.4021	320.251	8613.36	0	0
35	60.8813	321.072	8173.6	0	0
36	62.3605	321.942	7670.49	0	0
37	63.8396	322.864	7105.85	0	0
38	65.3188	323.838	6482.13	0	0
39	66.798	324.869	5802.55	0	0
40	68.2772	325.96	5071.15	0	0
41	69.7563	327.113	4293.35	0	0
42	71.2355	328.334	3477.61	0	0
43	72.7147	329.627	2632.35	0	0
44	74.1939	330.998	1767.29	0	0
45	75.673	332.453	894.188	0	0
46	77.1522	334	27.2618	0	0
47	78.4943	335.492	-818.689	0	0
48	79.8365	337.076	-1623.69	0	0
49	81.1786	338.763	-2350.35	0	0
50	82.5207	340.566	-2863.85	0	0
51	84.3409	343.227	0	0	0

B-B' Proposed - Static

Global Minimum Query (bishop simplified) - Safety Factor: 2.77385

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	10.2235	314.084	0	0	0
2	11.7759	313.715	109.107	0	0
3	13.3282	313.383	300.072	0	0
4	14.8805	313.09	559.957	0	0
5	16.4328	312.832	876.81	0	0
6	17.9852	312.612	1239.58	0	0
7	19.4643	312.435	1679.04	0	0
8	20.9435	312.291	2154.31	0	0
9	22.4227	312.179	2656.79	0	0
10	23.9019	312.099	3178.51	0	0
11	25.381	312.051	3712.06	0	0
12	26.8602	312.035	4251.98	0	0
13	28.3394	312.051	4797.58	0	0
14	29.8186	312.099	5342.53	0	0
15	31.2977	312.179	5880.21	0	0
16	32.7769	312.291	6404.4	0	0
17	34.2561	312.435	6909.31	0	0
18	35.7353	312.612	7389.52	0	0
19	37.2145	312.822	7839.98	0	0
20	38.6936	313.064	8255.99	0	0
21	40.1728	313.34	8633.19	0	0
22	41.652	313.65	8967.54	0	0
23	43.1312	313.994	9255.35	0	0
24	44.6103	314.373	9493.22	0	0
25	46.0895	314.787	9678.09	0	0
26	47.5687	315.238	9807.2	0	0
27	49.0479	315.725	9878.13	0	0
28	50.527	316.25	9888.78	0	0
29	52.0062	316.813	9837.37	0	0
30	53.4854	317.417	9722.5	0	0
31	54.9646	318.061	9543.12	0	0
32	56.4437	318.747	9298.56	0	0
33	57.9229	319.476	8988.57	0	0
34	59.4021	320.251	8613.36	0	0
35	60.8813	321.072	8173.6	0	0
36	62.3605	321.942	7670.49	0	0
37	63.8396	322.864	7105.85	0	0
38	65.3188	323.838	6482.13	0	0
39	66.798	324.869	5802.55	0	0
40	68.2772	325.96	5071.15	0	0
41	69.7563	327.113	4293.35	0	0
42	71.2355	328.334	3477.61	0	0
43	72.7147	329.627	2632.35	0	0
44	74.1939	330.998	1767.29	0	0
45	75.673	332.453	894.188	0	0
46	77.1522	334	27.2618	0	0
47	78.4943	335.492	-818.689	0	0
48	79.8365	337.076	-1623.69	0	0
49	81.1786	338.763	-2350.35	0	0
50	82.5207	340.566	-2863.85	0	0
51	84.3409	343.227	0	0	0

B-B' Proposed - Pseudostatic

Global Minimum Query (bishop simplified) - Safety Factor: 1.34144

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	10.0475	314.018	0	0	0
2	12.6433	314.12	209.553	0	0
3	15.2391	314.251	452.786	0	0
4	17.8349	314.409	721.735	0	0
5	20.4307	314.596	1008.87	0	0
6	23.0265	314.812	1307.06	0	0
7	25.9153	315.084	1814.62	0	0
8	28.8041	315.393	2374.55	0	0
9	31.6929	315.736	2985.24	0	0
10	34.5817	316.115	3633.39	0	0
11	37.4705	316.53	4306.42	0	0
12	40.3593	316.98	4992.43	0	0
13	43.248	317.467	5680.23	0	0
14	46.1368	317.99	6359.29	0	0
15	49.0256	318.55	7019.74	0	0
16	51.9144	319.146	7652.32	0	0
17	54.8032	319.78	8248.41	0	0
18	57.692	320.451	8799.99	0	0
19	60.5808	321.16	9299.62	0	0
20	63.4696	321.907	9740.49	0	0
21	66.3584	322.692	10116.3	0	0
22	69.2471	323.516	10421.4	0	0
23	72.1359	324.38	10650.3	0	0
24	75.0247	325.283	10798.8	0	0
25	77.9135	326.226	10863.7	0	0
26	80.8023	327.21	10842.6	0	0
27	83.6911	328.235	10751.1	0	0
28	86.5799	329.302	10619.4	0	0
29	89.4687	330.411	10461.2	0	0
30	92.3574	331.564	10274.6	0	0
31	95.2462	332.76	10071.6	0	0
32	98.135	334	9865.01	0	0
33	100.91	335.234	9514.29	0	0
34	103.685	336.511	9213.7	0	0
35	106.46	337.83	8976.98	0	0
36	109.235	339.194	8759.27	0	0
37	112.01	340.602	8616.21	0	0
38	114.786	342.056	8138.95	0	0
39	117.561	343.556	6731.35	0	0
40	120.336	345.104	5466.96	0	0
41	123.111	346.701	4197.43	0	0
42	125.886	348.347	2926.03	0	0
43	128.661	350.045	1677.26	0	0
44	131.436	351.794	496.791	0	0
45	134.211	353.598	-597.992	0	0
46	136.986	355.456	-1589.13	0	0
47	139.761	357.371	-2426.9	0	0
48	142.536	359.345	-3072.19	0	0
49	144.939	361.102	-3447.34	0	0
50	147.342	362.906	-3604.67	0	0
51	149.745	364.757	0	0	0

B-B' Proposed - No Cohesion

Global Minimum Query (bishop simplified) - Safety Factor: 2.62657

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	10.0475	314.018	0	0	0
2	12.6433	314.12	30.4923	0	0
3	15.2391	314.251	116.423	0	0
4	17.8349	314.409	250.001	0	0
5	20.4307	314.596	423.76	0	0
6	23.0265	314.812	630.555	0	0
7	25.9153	315.084	1040.48	0	0
8	28.8041	315.393	1510.1	0	0
9	31.6929	315.736	2039.83	0	0
10	34.5817	316.115	2618	0	0
11	37.4705	316.53	3233.42	0	0
12	40.3593	316.98	3875.42	0	0
13	43.248	317.467	4533.77	0	0
14	46.1368	317.99	5198.73	0	0
15	49.0256	318.55	5861.04	0	0
16	51.9144	319.146	6511.88	0	0
17	54.8032	319.78	7142.89	0	0
18	57.692	320.451	7746.16	0	0
19	60.5808	321.16	8314.24	0	0
20	63.4696	321.907	8840.12	0	0
21	66.3584	322.692	9317.25	0	0
22	69.2471	323.516	9739.5	0	0
23	72.1359	324.38	10100.1	0	0
24	75.0247	325.283	10393.8	0	0
25	77.9135	326.226	10616.4	0	0
26	80.8023	327.21	10764.5	0	0
27	83.6911	328.235	10829.1	0	0
28	86.5799	329.302	10821.8	0	0
29	89.4687	330.411	10761.5	0	0
30	92.3574	331.564	10657.5	0	0
31	95.2462	332.76	10520.3	0	0
32	98.135	334	10361	0	0
33	100.91	335.234	10091.4	0	0
34	103.685	336.511	9841.4	0	0
35	106.46	337.83	9623.54	0	0
36	109.235	339.194	9411.14	0	0
37	112.01	340.602	9244.02	0	0
38	114.786	342.056	8835.23	0	0
39	117.561	343.556	7741.81	0	0
40	120.336	345.104	6731.38	0	0
41	123.111	346.701	5697.44	0	0
42	125.886	348.347	4643.48	0	0
43	128.661	350.045	3589.49	0	0
44	131.436	351.794	2572.96	0	0
45	134.211	353.598	1610.09	0	0
46	136.986	355.456	717.843	0	0
47	139.761	357.371	-60.218	0	0
48	142.536	359.345	-688.104	0	0
49	144.939	361.102	-1157.97	0	0
50	147.342	362.906	-1454.15	0	0
51	149.745	364.757	0	0	0

Entity Information

A-A" Existing

Shared Entities

Type	Coordinates (x,y)
External Boundary	0, 324 0, 318 0, 310 1.11022e-16, 304 0, 290 240, 290 240, 304 240, 310 240, 334 240, 363.228 240, 373 230, 372 228, 370 224, 370 217, 374 206, 375 180.055, 372.22 178, 372 173, 370 141, 348 110, 336 82, 332 62, 326 46, 324 22, 322 12, 321
Material Boundary	0, 318 12, 315 22, 316 46, 318 62, 320 82, 326 110, 330 120.333, 334 141, 342 167.843, 359.182 180.055, 360.369 206.239, 363.228 227.076, 363.228 240, 363.228
Material Boundary	120.333, 334 240, 334
Material Boundary	0, 310 240, 310
Material Boundary	1.11022e-16, 304 240, 304

Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario	Static	Pseudostatic	No Cohesion
Water Table	2.22045e-16, 307 240, 307	Assigned to: 4) VD SAND with gravel	Assigned to: 4) VD SAND with gravel	Assigned to: 4) VD SAND with gravel	Assigned to: 4 No Cohes

A-A' Proposed

Shared Entities

Type	Coordinates (x,y)
External Boundary	0, 324 0, 318 0, 310 1.11022e-16, 304 0, 290 240, 290 240, 304 240, 310 240, 334 240, 363.228 240, 373 230, 372 228, 370 224, 370 217, 374 206, 375 196, 374 178, 369 165, 364 146, 352 136, 352 112, 349 93, 340 88, 339 84, 339 84, 330 62, 326 46, 324 22, 322 12, 321
Material Boundary	0, 318 12, 315 22, 316 46, 318 62, 320 82, 326 110, 330 120.333, 334 141, 342 167.843, 359.182 180.055, 360.369 206.239, 363.228 227.076, 363.228 240, 363.228
Material Boundary	120.333, 334 240, 334

Material Boundary	0, 310 240, 310
Material Boundary	1.11022e-16, 304 240, 304
Material Boundary	84, 330 88, 330 88, 339
Material Boundary	88, 330 96, 330 110, 336 138, 346 146, 352

Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario	Static	Pseudostatic	No Cohesion
Water Table	2.22045e-16, 307 240, 307	Assigned to: 4) VD SAND with gravel 6) Structura Fill	Assigned to: 4) VD SAND with gravel 6) Structura Fill	Assigned to: 4) VD SAND with gravel 6) Structura Fill	Assigned to: 4 No Cohes 6) Structura Fill

B-B' Existing

Shared Entities

Type	Coordinates (x,y)
External Boundary	0, 308 0, 304 0, 300 154, 300 154, 304 154, 310 154, 334 154, 360 154, 365 136.5, 364 126.5, 362 121, 360 93, 350 69, 340 26, 320 10, 314 0, 313
Material Boundary	0, 308 10, 309 12, 310 67, 334 93, 345 121, 355 136.5, 359 154, 360
Material Boundary	67, 334 154, 334
Material Boundary	12, 310 154, 310
Material Boundary	0, 304 154, 304

Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario	Static	Pseudostatic	No Cohesion
Water Table	0, 307 154, 307	Assigned to: 4) VD SAND with gravel	Assigned to: 4) VD SAND with gravel	Assigned to: 4) VD SAND with gravel	Not assigned to any materials

B-B' Proposed

Shared Entities

Type	Coordinates (x,y)
External Boundary	0, 308 0, 304 0, 300 154, 300 154, 304 154, 310 154, 334 154, 360 154, 365 136.5, 364 126.5, 362 121, 360 118, 359 116, 359 114, 359 114, 350.609 114, 343 107, 343 107, 342 87, 342 86.4783, 342.241 80.5, 345 69, 340 26, 320 10, 314 0, 313
Material Boundary	12, 310 114, 310 116, 310 154, 310
Material Boundary	0, 304 154, 304
Material Boundary	0, 308 10, 309 12, 310 67, 334 86.4783, 342.241
Material Boundary	116, 353.62 121, 355 136.5, 359 154, 360
Material Boundary	114, 343 114, 334 114, 310 114, 308 116, 308 116, 310 116, 334 116, 353.62 116, 359
Material Boundary	67, 334 114, 334 116, 334 154, 334

Scenario-based Entities

Type	Coordinates (x,y)	Master Scenario	Static	Pseudostatic	No Cohesion
Water Table	0, 307 154, 307	Assigned to: 4) VD SAND with gravel	Assigned to: 4) VD SAND with gravel	Assigned to: 4) VD SAND with gravel	Not assigned to any materials

APPENDIX C

INFILTRATION FIELD TEST RESULTS

Test Number: PIT-1
Project Name: Wu Property
Project Number: T-8671
Test Date: 10/24/2023
Test Procedure: Small PIT
Hole Dimensions: 4' x 4' x 4.5' D
Hole Area: 16 square feet

Steady State Flow Test			
Time (minutes)	Flow Rate (gpm)	Head (feet)	Cum. Volume (gallons)
0	3.00	1.33	285
15	3.00	1.34	335
30	3.00	1.36	383
45	3.00	1.39	438
60	3.00	1.4	480

Use mean flow rate over final 30 minutes of test as steady state infiltration rate

3.00	**gallons per minute**
0.40	**cubic feet per minute**

Infiltration rate=steady state flow divided by area of pit

0.0251	**feet per minute**
0.3008	**inches per minute**
18.0469	**inches per hour**

Falling Head Test	
Time (minutes)	Head (feet)
0.00	1.4
15.00	1.14
30.00	0.91
45.00	0.72
60.00	0.57

Measured Infiltration Rate		
Steady Flow Rate Test	**18.05**	**inches per hour**
Falling Head Test	**9.96**	**inches per hour**

Correction Factors (F)	
$F_{testing}$	0.5
$F_{geometry}$	0.43
$F_{plugging}$	0.9

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Corrected Steady State Infiltration Rate	**3.49**	**inches per hour**
Corrected Falling Head Infiltration Rate	1.93	**inches per hour**

Appendix C – Other Reports

None at this time