CHRISTIAN WHEELER
ENGINEERING

REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION

VILLA MONTANA HOMES
13995 MIRA MONTANA DRIVE
SAN DIEGO, CALIFORNIA

PREPARED FOR

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March 27, 2020

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San Diego, California 92121

CWE 2200089.02

Subject: **Report of Preliminary Geotechnical Investigation**
Villa Montana Homes, 13995 Mira Montana Drive, San Diego, California

Dear Mr. Garibay:

In accordance with your request and our proposal dated January 31, 2020, we have completed a preliminary geotechnical investigation for a proposed residential project to be constructed at the subject property. We are presenting herewith a report of our findings and recommendations.

It is our opinion and judgment that no geotechnical conditions exist at or in the vicinity of the subject property that would preclude the construction of the proposed residential project provided the recommendations included in this report are implemented.

If you have any questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,
CHRISTIAN WHEELER ENGINEERING

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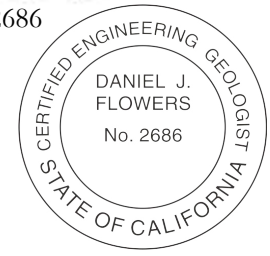

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PRELIMINARY GEOTECHNICAL INVESTIGATION

VILLA MONTANA HOMES
13995 MIRA MONTANA DRIVE
SAN DIEGO, CALIFORNIA

INTRODUCTION AND PROJECT DESCRIPTION

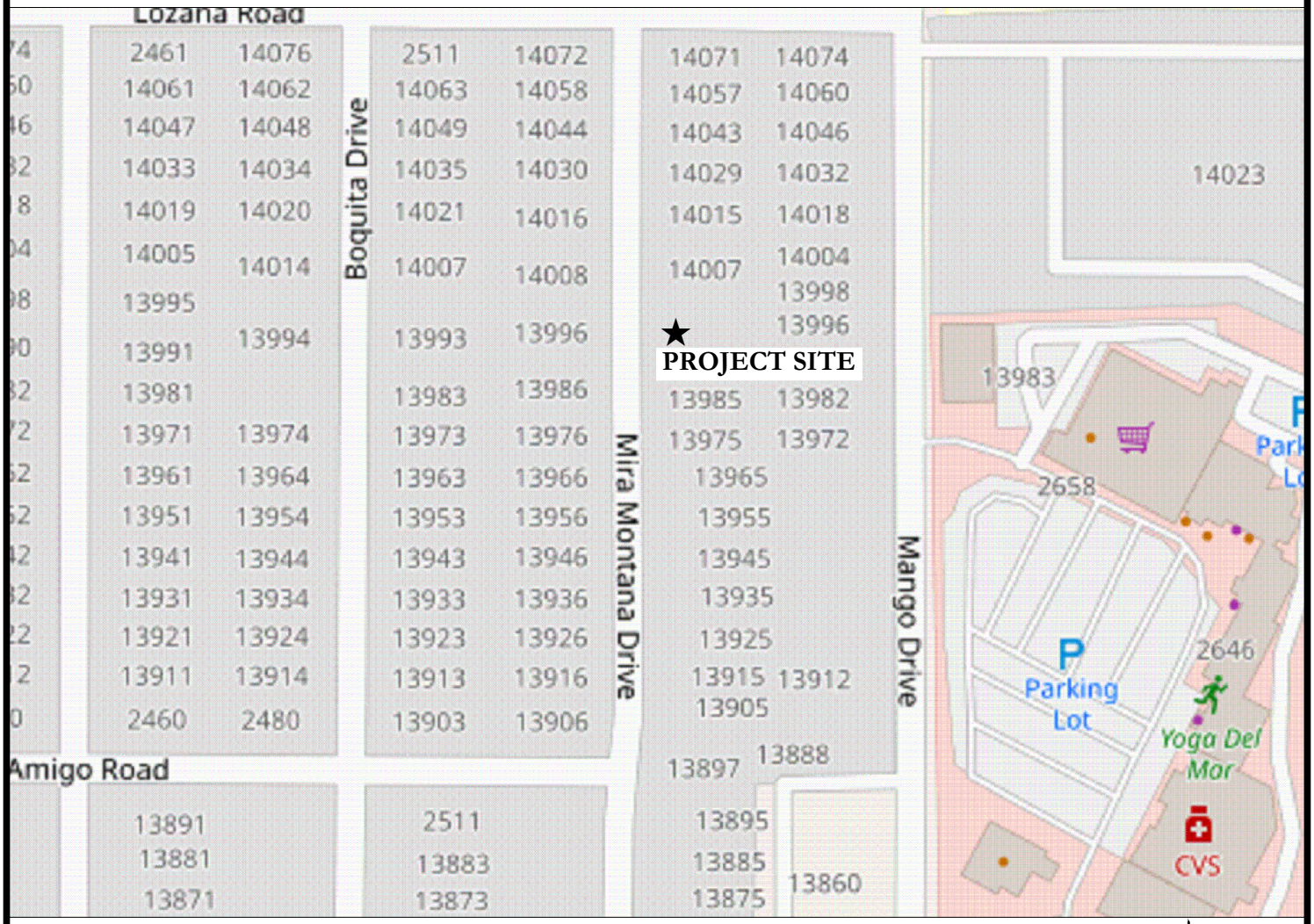
This report presents the results of a preliminary geotechnical investigation performed for a proposed residential project to be located at 13995 Villa Montana Drive, San Diego, California. The following Figure No. 1 presents a vicinity map showing the location of the property.

We understand that the subject project will consist of the construction of two two-story residential structures. It is anticipated that the proposed structures will be of wood-frame and masonry construction, supported by shallow foundations and will incorporate conventional on-grade concrete floor slabs. The structures will also incorporate retaining walls up to about 5 feet high. Exterior improvements will include a swimming pool and two spas. Depending on its proposed location, the swimming pool and spas may be supported by a drilled, cast-in-place concrete pier foundation system. Grading to accommodate the proposed construction is expected to consist of cuts and fills less than about 5 feet from existing grade.

To assist in the preparation of this report, we were provided with a set of miscellaneous architectural drawings prepared by Alta Design Development, dated November 19, 2919, and a topographic survey prepared by Coffey Engineering, Inc., dated September 12, 2019. A copy of a site plan included in the architectural plan set was used as a base map for our Site Plan and Geologic Map, and is included herein as Plate No. 1. Our Geologic Cross Sections are based on the topographic survey and elevations obtained using simple hand instruments measured against existing monuments. The Geologic Cross Sections are included herein as Plate Nos. 2 through 4.

This report has been prepared for the exclusive use of Alejandro Garibay, and his design consultants, for specific application to the project described herein. Should the project be modified, the conclusions and recommendations presented in this report should be reviewed by Christian Wheeler Engineering for conformance with our recommendations and to determine whether any additional subsurface investigation, laboratory testing and/or recommendations are necessary. Our professional services have been performed,

SITE VICINITY



VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
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our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, expressed or implied.

SCOPE OF SERVICES

Our preliminary geotechnical investigation consisted of surface reconnaissance, subsurface exploration, obtaining representative soil samples, laboratory testing, analysis of the field and laboratory data, and review of relevant geologic literature. Our scope of service did not include assessment of hazardous substance contamination, recommendations to prevent floor slab moisture intrusion or the formation of mold within the structures, evaluation or design of storm water infiltration facilities, or any other services not specifically described in the scope of services presented below.

More specifically, the intent of our proposed investigation was to:

- Obtain a boring permit from the County of San Diego Department of Environmental Health to conduct the proposed subsurface investigation.
- Drill 2 exploratory borings with a truck mounted drill rig to explore existing soil conditions and obtain soil samples for laboratory testing.
- Backfill the boring holes using a grout or a grout/bentonite mix as required by the County of San Diego Department of Environmental Health.
- Evaluate, by laboratory tests and our past experience with similar soil types, the engineering properties of the various soil strata that may influence the proposed construction, including bearing capacities, expansive characteristics and settlement potential.
- Describe the general geology at the site including possible geologic hazards that could have an effect on the proposed construction, and provide the seismic design parameters in accordance with the 2019 edition of the California Building Code.
- Discuss potential construction difficulties that may be encountered due to soil conditions, groundwater, or geologic hazards, and provide geotechnical recommendations to mitigate identified construction difficulties.
- Provide site preparation and grading recommendations for the anticipated work.
- Provide foundation recommendations for the type of construction anticipated and develop soil engineering design criteria for the recommended foundation designs.
- Provide design parameters for restrained and unrestrained retaining walls.

- Provide a preliminary geotechnical report presenting the results of our investigation, including a plot plan showing the location of our subsurface explorations, excavation logs, laboratory test results, and our conclusions and recommendations for the proposed project.

Although a test for the presence of soluble sulfates within the soils that may be in contact with reinforced concrete was performed as part of the scope of our services, it should be understood Christian Wheeler Engineering does not practice corrosion engineering. If a corrosivity analysis is considered necessary, we recommend that the client retain an engineering firm that specializes in this field to consult with them on this matter. The results of our sulfate testing should only be used as a guideline to determine if additional testing and analysis is necessary.

FINDINGS

SITE DESCRIPTION

The subject site consists of a vacant, rectangular-shaped lot located at 13995 Mira Montana Drive, San Diego, California. The property is bounded on the west by Mira Montana Drive, and is otherwise bounded by residential properties. Topographically, the western two-thirds of the site slopes gently to east. A relatively natural inland bluff characterizes the southeastern portion of the site. This inland bluff, which is up to about 20 feet in height, descends to the southeasterly property line at inclinations ranging from about 2:1 (horizontal to vertical) to near vertical. The upper 5 to 8 feet of the bluff were observed to be near vertical and in areas overhanging. A cut slope descends off-site to the east along the easterly property line at an approximate inclination of 1.5:1 (horizontal to vertical) and has an overall estimated height of about 25 feet. According to the topographic survey, site elevations range from about 398 along the western property line to about 360 feet near the southeastern corner.

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located in the Coastal Plains Physiographic Province of San Diego County. Based upon the findings of our subsurface explorations and review of readily available, pertinent geologic and geotechnical literature, it was determined that the project area is underlain by topsoil and very old paralic deposits. These materials are described below in order of increasing age:

TOPSOIL: A topsoil layer extending to a maximum depth of about 2 feet from existing grade was found to underlie the flat-lying portion of site. As encountered in our explorations, the topsoil generally

consisted of light brown, dry and moist, loose, silty sand with gravel (SM). The topsoil was judged to have a very low expansive potential (EI<20).

VERY OLD PARALIC DEPOSITS (Qvop): Quaternary-age very old paralic deposits underlie the topsoil to the maximum exploration depth of about 40 feet below existing grade. As encountered in our subsurface exploration, the very old paralic deposits consisted of orangish-brown and reddish brown, damp, silty sand with occasional gravel (SM). These materials were found to be medium dense to dense to a depth of about 3 feet and 6 feet below existing grade, in borings B-1 and B-2, respectively. Below said depth and in the slope, the very old paralic deposits were found to be very dense. The very old paralic deposits were judged to have a very low expansive potential (EI<20).

GROUNDWATER: No groundwater or seepage was encountered in our subsurface explorations. However, it should be recognized that minor groundwater seepage problems might occur after construction and landscaping are completed, even at a site where none were present before construction. These are usually minor phenomena and are often the result of an alteration in drainage patterns and/or an increase in irrigation water. Based on the anticipated construction and the permeability of the on-site soils, it is our opinion that any seepage problems that may occur will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and when they occur.

TECTONIC SETTING: No faults are known to traverse the subject site. However, it should be noted that much of Southern California, including the San Diego County area, is characterized by a series of Quaternary-age fault zones that consist of several individual, en echelon faults that generally strike in a northerly to northwesterly direction. Some of these fault zones (and the individual faults within the zone) are classified as "active" according to the criteria of the California Division of Mines and Geology. Active fault zones are those that have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,000 years). The Division of Mines and Geology used the term "potentially active" on Earthquake Fault Zone maps until 1988 to refer to all Quaternary-age (last 1.6 million years) faults for the purpose of evaluation for possible zonation in accordance with the Alquist-Priolo Earthquake Fault Zoning Act and identified all Quaternary-age faults as "potentially active" except for certain faults that were presumed to be inactive based on direct geologic evidence of inactivity during all of Holocene time or longer. Some faults considered to be "potentially active" would be considered to be "active" but lack specific criteria used by the State Geologist, such as *sufficiently active* and *well-defined*. Faults older than Quaternary-age are not specifically defined in Special Publication 42, Fault Rupture Hazard Zones in California, published by the California Division of Mines and Geology. However, it is generally accepted that faults showing no movement during the Quaternary period may be considered to be "inactive". The City of San Diego guidelines indicate that since the beginning of the Pleistocene Epoch marks the boundary between

"potentially active" and "inactive" faults, unfaulted Pleistocene-age deposits are accepted as evidence that a fault may be considered to be "inactive."

A review of available geologic maps indicates that the nearest active fault zone is the Newport-Inglewood Rose-Canyon Fault Zone, located approximately 3 miles west of the site. Other fault zones in the region that could possibly affect the site include the Coronado Bank, San Diego Trough and San Clemente fault zones to the west, the Palos Verdes fault zone to the northwest, and the Elsinore, Earthquake Valley, San Jacinto, and San Andreas fault zones to the northeast.

GENERAL GEOLOGIC HAZARDS

GENERAL: The site is located in an area where the risks due to significant geologic hazards are relatively low. No geologic hazards of sufficient magnitude to preclude the construction of the subject project are known to exist. In our professional opinion and to the best of our knowledge, the site is suitable for the proposed improvements.

CITY OF SAN DIEGO SEISMIC SAFETY STUDY: As part of our services, we have reviewed the City of San Diego Seismic Safety Study. This study is the result of a comprehensive investigation of the City that rates areas according to geological risk potential (nominal, low, moderate, and high) and identifies potential geotechnical hazards and/or describes geomorphic conditions.

According to the San Diego Seismic Safety Study Map No. 38, the site is located in Geologic Hazards Category 52. Category 52 is assigned to level or steep terrain with favorable geologic structure, where the risks are classified as low. Based on the results of our limited study, it is our opinion that the potential risks can be considered to be low.

LANDSLIDE POTENTIAL AND SLOPE STABILITY: As part of this investigation we reviewed the publication, "Landslide Hazards in the Northern Part of the San Diego Metropolitan Area" by Tan and Giffen, 1995. This reference is a comprehensive study that classifies San Diego County into areas of relative landslide susceptibility. The subject site is located in Relative Landslide Susceptibility Area 3-1. Area 3 is considered to be "generally susceptible" to slope movement; Subarea 3-1 classifications are considered at or near their stability limits due to steep slopes and can be expected to fail locally when adversely modified. Sites within this classification are located outside the boundaries of known landslides but may contain observably unstable slopes that may be underlain by weak materials and/or adverse geologic structure.

The near-vertical slopes at the site are comprised of the very competent Quaternary-age sandstones and are considered to possess a low potential in their natural state for landsliding. Based on the recommended foundation setbacks from the bluff and the implementation of area drains to channel water away from the bluff top, it is our opinion that the potential for slope failures within the bluff will remain low after the proposed construction. Furthermore, the large roof area of the proposed houses will collect a substantial amount of the runoff that would normally flow over the top of the bluff and discharge this water through the new storm drain system. It is further our opinion that the proposed construction will not destabilize the existing slopes or neighboring properties if the recommendations presented in this report are implemented.

SLOPE STABILITY ANALYSES

GENERAL: In consideration of the existing inland bluff at the subject site and the cut slope east of the site, we have performed a series of quantitative slope stability analyses to determine the factors-of-safety against deep-seated slope failure for the slope that descends to the project area. It is our professional opinion that the cross sections modeled in our stability analyses, oriented perpendicular to the steepest portions of the slope, and represent the worst-case scenario with regards to gross slope stability at the subject site. We have also performed a surficial stability analysis to determine the minimum factor-of-safety against surficial failure. Descriptions of our stability analyses are presented in the following "Gross Stability Analyses" and "Surficial Stability Analyses" sections of this report.

GROSS STABILITY ANALYSES

CROSS-SECTIONS: As presented on our Site Plan and Geotechnical Map, included herein as Plate No. 1, we have created geologic cross sections A-A' and B-B' to depict the topography and subsurface conditions at the subject site. The geologic cross sections are included on Plate Nos. 2 and 3 of this report. The locations of the geologic cross sections were chosen to be oriented perpendicular to the slope and included the steepest portions of the slope.

To analyze the stability of the subject site we have performed a series of quantitative slope stability analyses incorporating the topography and geologic conditions presented on our geologic cross sections A-A' and B-B'. The on-site earth materials incorporated in our stability analyses are described above in the "Geologic Setting and Soil Description" section of this report. Based on the configuration of the site and the composition of the underlying formational material, circular- type failure mechanisms were modeled in our analyses. The results of our quantitative slope stability analyses are presented below in the results of Stability Analyses Section of this report.

STRENGTH PARAMETERS: The strength parameters for the earth materials underlying the subject site were estimated by the direct shear test method and our experience and judgment with similar soil types. The results of our direct shear testing are presented in Appendix B of this report. The unit weights of the earth materials that underlie the subject site and adjacent areas utilized in our stability analyses were chosen based on the results of our laboratory testing and our experience with similar materials in the vicinity of the subject site. It is our professional opinion that the strength parameters and unit weights presented below and utilized in our stability analyses provide for conservative slope stability analyses.

Soil Type	Unit Weight, ↑	Phi, ←	Cohesion, c
Topsoil	120 pcf	20⌈	200 psf
Very Old Paralic Deposits (Qvop)	125 pcf	31°	250 psf

METHOD OF ANALYSES: The analyses of the gross stability of the proposed site topography were performed using Version 2 of the GSTABL7 computer program developed by Garry H. Gregory, PE. The program analyzes circular, block, specified, and randomly shaped failure surfaces using the Modified Bishop, Janbu, or Spencer's Methods. The STEDwin computer program, developed by Harald W. Van Aller, P. E., was used in conjunction with this program for data entry and graphics display. The proposed topography of the subject site along geologic cross sections A-A' and B-B' were analyzed for circular-type failures and each failure analysis was programmed to run at least 2,000 random failure surfaces. The most critical failure surfaces were then accumulated and sorted by value of the factor-of-safety. After the specified number of failure surfaces were successfully generated and analyzed, the ten most critical surfaces were plotted so that the pattern may be studied.

RESULTS OF STABILITY ANALYSES: Appendix E of this report presents the results of our static, gross stability analyses. As demonstrated on the printouts of these analyses, the site topography along our geologic cross sections A-A' and B-B' demonstrate minimum factors-of-safety against static failure ranging from 1.7 to 2.9. These values meet the minimum that is generally considered to be stable of 1.5. As also included in Appendix E, our pseudo-static stability analyses, performed incorporating a kh value of 0.15g, demonstrate minimum factors-of-safety against pseudo-static failure ranging from 1.4 to 1.9. These values are in excess of the minimum that is generally considered to be stable of 1.1 for pseudo-static analyses. It is further our opinion that the proposed construction will not significantly affect the stability of the existing slope. Historically, deep seated slope failures along inland bluffs comprised of very old paralic deposits have been relatively uncommon. It is our opinions that slope will continue to perform in a similar manner as it has for the last few decades. However, over-steepening of such inland

bluffs by grading activities, erosion, or alterations in local drainage patters has caused localized surficial block falls and the potential for future block falls along the near vertical portions of the inland bluff cannot be ruled out.

SURFICIAL SLOPE STABILITY

GENERAL: Appendix F of this report presents the results of our surficial slope stability analysis of the steepest portions of the natural slopes on-site as well as the cut slopes off-site. As demonstrated on the printout of this analysis, the 1.5:1 (horizontal to vertical) cut slope along the easterly property line demonstrates a factor-of-safety of 1.5 against shallow, surficial failures, which is the minimum generally considered to be stable. However, the near vertical portions of the inland bluff on-site demonstrate a factor-of-safety of 1.2 against shallow, surficial failures, which is less than the minimum generally considered to be stable. Furthermore, burrowing ground squirrels and the saturation of the near surface soils along the face of slopes like the one at the subject site often results in surficial block falls where the outermost few feet of the soil mass fail roughly parallel to the slope face. Minor surficial block falls within the very old paralic deposits can be expected over time within the near vertical portions of the inland bluff. This condition was considered in the foundation recommendations provided in the foundation section of this report.

LIQUEFACTION: The near-surface soils encountered at the site are not considered susceptible to liquefaction due to such factors as soil density and the absence of shallow groundwater conditions.

FLOODING: As delineated on the Flood Insurance Rate Map (FIRM), map number 06073C1328G prepared by the Federal Emergency Management Agency, the site is in Zone X which is considered to be an "area of minimal flood hazard." Areas of minimal flood hazards are located outside of the boundaries of both the 100-year and 500-year flood zones.

TSUNAMIS: Tsunamis are great sea waves produced by submarine earthquakes or volcanic eruptions. Due to the site's elevation and location, the site is not subject to risk from tsunamis.

SEICHES: Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. Due to the site's location, it should not be affected by seiches.

OTHER POTENTIAL GEOLOGIC HAZARDS: Other potential geologic hazards such as, volcanoes or seismic-induced settlement should be considered to be negligible or nonexistent.

CONCLUSIONS

In general, it is our professional opinion and judgment that the subject property is suitable for the construction of the subject project provided the recommendations presented herein are implemented. The main geotechnical conditions affecting the proposed project consist of potentially compressible topsoil, cut/fill transitions, steep slopes, and very dense very old paralic deposits.

The flat-lying portion of the subject site was found to be underlain by loose topsoil extending to a maximum depth of about 2 feet below existing grade (Boring B-2). Deeper topsoil may exist in areas of the site not investigated. The topsoil is considered unsuitable, in its present condition, for the support of settlement sensitive improvements and will have to be removed and replaced as compacted fill as described hereinafter.

It is anticipated that the proposed grading to achieve finish pad grades as well as the recommended site preparation will result in cut/fill transitions underlying the proposed structures. Cut/fill transitions are not recommended due to the potential for differential settlement due to the different compression characteristics of compacted fill and very old paralic deposits. Special compaction, foundation, and slab-on-grade recommendations are provided hereinafter to mitigate this condition.

The steep inland bluff which encompasses the easterly portion of the site is comprised of the very competent Quaternary-age sandstones which, in our opinion are considered to possess a low potential in their natural state for landsliding. A setback from the bluff is recommended in the foundation section of the report. Improvements encroaching into this setback, including decks, spas and swimming pool, will require special foundation consideration ranging from deepened conventional footings to drilled cast-in-place concrete piers. Provided these recommendations are heeded it is our opinion that the potential for erosion and slope failures within the bluff can be considered to be low after the proposed construction is completed. The presence of the steep inland bluff does, however, pose a risk for relatively shallow block falls and surficial slope failures. Provided care is taken to reduce disturbance to this bluff and minimize, to the greatest extent possible, the amount of water that is introduced to the bluff (either by irrigation or surface drainage), the bluff should continue to perform in a similar manner as it has for the last few decades. This is not to say that the bluff will not experience localized erosion and failures over time. The owner of the property should realize that an episodic pattern of erosion, steepening, and localized, relatively shallow block falls and surficial slope failures will likely occur, even in the absence of activities of man.

The site is located in an area that is relatively free of geologic hazards that will have a significant effect on the proposed construction. The most likely geologic hazard that could affect the site is ground shaking due to

seismic activity along one of the regional active faults. However, construction in accordance with the requirements of the most recent edition of the California Building Code and the local governmental agencies should provide a level of life-safety suitable for the type of development proposed.

RECOMMENDATIONS

GRADING AND EARTHWORK

GENERAL: All grading should conform to the guidelines presented in the current edition of the California Building Code, the minimum requirements of the City of San Diego, and the recommended Grading Specifications and Special Provisions attached hereto, except where specifically superseded in the text of this report.

PREGRADE MEETING: It is recommended that a pregrade meeting including the grading contractor, the client, and a representative from Christian Wheeler Engineering be performed, to discuss the recommendations of this report and address any issues that may affect grading operations.

OBSERVATION OF GRADING: Continuous observation by the Geotechnical Consultant is essential during the grading operation to confirm conditions anticipated by our investigation, to allow adjustments in design criteria to reflect actual field conditions exposed, and to determine that the grading proceeds in general accordance with the recommendations contained herein.

CLEARING AND GRUBBING: Site preparation should begin with the removal of any existing vegetation and other deleterious materials in areas to receive proposed improvements or new fill soils.

SITE PREPARATION: It is recommended that topsoil underlying the proposed structures and associated improvements be removed in their entirety. Based on our findings, maximum removal depth will be about 2 feet from existing grade (boring B-2). Deeper removals may be necessary in areas of the site not investigated or due to unforeseen conditions. Lateral removals limits should extend across the entire flat lying portion of the property. No removals should be performed beyond property lines or within 5 feet from the top of the existing bluff. All excavated areas should be approved by the geotechnical engineer or his representative prior to replacing any of the excavated soils. The excavated materials can be replaced as properly compacted fill in accordance with the recommendations presented in the "Compaction and Method of Filling" section of this report provided that they are free of roots.

EXCAVATION CHARACTERISTICS: It is anticipated that excavations within the very old paralic deposits may be performed utilizing appropriately sized, heavy-duty, grading equipment in good working order. However, excavations utilizing light trenching may be difficult.

PROCESSING OF FILL AREAS: Prior to placing any new fill soils or constructing any new improvements in areas that have been cleaned out to receive fill, the exposed soils should be scarified to a depth of about 12 inches, moisture conditioned, and compacted to at least 90 percent relative compaction. This recommendation does not apply to the footprint of the proposed structures.

COMPACTION AND METHOD OF FILLING: In general, all structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of its maximum laboratory dry density as determined by ASTM Laboratory Test D1557. Structural fill placed under the proposed structures should be compacted to a relative compaction of at least 95 percent. Fills should be placed at or slightly above optimum moisture content, in lifts six to eight inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by the Geotechnical Consultant. Fill material should be free of rocks or lumps of soil in excess of 6 inches in maximum dimension.

Utility trench backfill within 5 feet of the proposed structure and beneath all concrete flatwork or pavements should be compacted to a minimum of 90 percent of its maximum dry density.

TEMPORARY SLOPES: The contractor is solely responsible for designing and constructing stable, temporary excavations and will need to shore, slope, or bench the sides of trench excavations as required to maintain the stability of the excavation sides. The contractor's "competent person", as defined in the OSHA Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. We anticipate that the existing on-site soils will consist of Type C material. Our firm should be contacted to observe all temporary cut slopes during grading to ascertain that no unforeseen adverse conditions exist. No surcharge loads such as foundation loads, or soil or equipment stockpiles, vehicles, etc. should be allowed within a distance from the top of temporary slopes equal to half the slope height.

TEMPORARY SHORING

GENERAL: Shoring may be necessary for the proposed construction. It is anticipated that the shoring system will utilize soldier beams with wooden lagging. The following design parameters may be assumed to calculate earth pressures on shoring.

Angle of friction	32°
Apparent cohesion	100 pounds per square foot
Soil unit weight	125 pounds per cubic foot (pcf)

Active pressures can be applied to shoring that is capable of rotating 0.002 radians. At-rest pressures should be applied to a shoring system that is unyielding and not able to rotate. These values do not include surcharge loads. Construction surcharge loads should be evaluated on a case-by-case basis. Vertical and lateral movements of the temporary shoring are expected to be small assuming an adequate lateral support system. Christian Wheeler Engineering does not design the temporary shoring. The shoring designer should provide any limitations on length of time the shoring can remain in place before being supported, if required by the City of San Diego.

SURFACE DRAINAGE: The drainage around the proposed improvements should be designed to collect and direct surface water away from proposed improvements and the top of slopes toward appropriate drainage facilities. Rain gutters with downspouts that discharge runoff away from the structure into controlled drainage devices are recommended.

The ground around the proposed improvements should be graded so that surface water flows rapidly away from the improvements without ponding. In general, we recommend that the ground adjacent to structure slope away at a gradient of at least 5 percent for a minimum distance of 10 feet. If the minimum distance of 10 feet cannot be achieved, an alternative method of drainage runoff away from the building at the termination of the 5 percent slope will need to be used. Swales and impervious surfaces that are located within 10 feet of the building should have a minimum slope of 2 percent. It is essential that new and existing drainage patterns be coordinated to produce proper drainage. Pervious hardscape surfaces adjacent to structures should be similarly graded.

Drainage patterns provided at the time of construction should be maintained throughout the life of the proposed improvements. Site irrigation should be limited to the minimum necessary to sustain landscape

growth. Over watering should be avoided. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, zones of wet or saturated soil may develop.

FOUNDATIONS

GENERAL: Based on our findings and engineering judgment, the proposed structures and associated improvements may be supported by conventional shallow continuous and isolated spread footings. However, improvements within the setback line defined hereinafter may have to be supported by deepened conventional foundations or drilled cast-in-place concrete piers. The following recommendations are considered the minimum based on the anticipated soil conditions after site preparation as recommended in our geotechnical report is performed, and are not intended to be lieu of structural considerations. All foundations should be designed by a qualified professional.

FOUNDATION SETBACK: It is recommended that footings supporting the proposed structures or exterior improvements extend at least 1 foot below an ascending line extending into the site, starting at the toe of the steep or overhanging portion of the bluff located at the eastern portion of the site.

SHALLOW FOUNDATIONS

DIMENSIONS: Spread footings supporting the proposed structures should be embedded at least 18 inches below lowest adjacent finish pad grade, and extending at least 6 inches into competent very old paralic deposits, whichever is more. Spread footings supporting miscellaneous light exterior improvements should be embedded at least 12 inches below lowest adjacent finish pad grade, and may be founded on newly compacted fill or very old paralic deposits. Continuous and isolated footings should have a minimum width of 12 inches and 24 inches, respectively. Retaining wall footings should be at least 18 inches deep and 24 inches wide. Footings located near descending slopes should be extended to a depth such that a minimum horizontal distance of 10 feet exists between the face of slope and the lower outside footing edge. Property line footings should also extend at least 6 inches into competent very old paralic deposits.

BEARING CAPACITY: Spread footings supporting the proposed structure with a minimum depth of 18 inches and a minimum width of 12 inches may be designed for an allowable soil bearing pressure of 4,000 pounds per square foot (psf). This value may be increased by 700 psf for each additional foot of embedment and 500 psf for each additional foot of width up to a maximum of 6,000 pounds per square foot. Spread footings supporting the proposed miscellaneous light exterior improvements may

be designed for an allowable soil bearing pressure of 2,000 psf. These values may be increased by one-third for combinations of temporary loads such as those due to wind or seismic loads.

FOOTING REINFORCING: Reinforcement requirements for foundations should be provided by a structural designer. However, based on the expected soil conditions, we recommend that the minimum reinforcing for continuous footings consist of at least 2 No. 5 bars positioned near the bottom of the footing and 2 No. 5 bars positioned near the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.30. The passive resistance may be considered to be equal to an equivalent fluid weight of 300 pounds per cubic foot. These values are based on the assumption that the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

CONCRETE CAST-IN-PLACE PIERS

MINIMUM PIER DIMENSIONS: Cast-in-place concrete pier foundations should have a minimum diameter of 24 inches. The piers should extend to a minimum depth of 10 feet below the existing grade and 5 feet into very old paralic deposits, whichever is more. At this depth, a bearing capacity of 10,000 pounds per square foot (psf) may be assumed for said piers. This bearing pressure may be increased by 900 psf for each additional foot of depth, and 700 psf for each additional foot of width, up to a maximum bearing pressure of 20,000 psf. This value may be increased by one-third when considering wind and/or seismic loads.

PIER REINFORCING: The reinforcing steel for the piers should be specified by the project structural designer. As a minimum, we recommend that the pier reinforcing extend the full depth of the pier excavation.

LATERAL BEARING CAPACITY: The allowable lateral bearing resistance to lateral loads for the portion of the piers may be assumed to be 300 pounds per square foot per foot of depth up to a maximum of 3,000 pounds per square foot. This value may be assumed to act below the setback line and on an area equal to twice the pier diameter.

PIER EXCAVATION OBSERVATION AND CLEANING: The pier excavations should be observed by a member of our staff to determine that the minimum embedment recommend in this report is achieved. Prior to placing the steel reinforcing cages, all loose or disturbed soils at the bottom of the pier excavations should be removed. The cleanout of the pier excavations should be approved by the geotechnical engineer.

DRILLING CHARACTERISTICS: It is anticipated that the proposed piers may be drilled utilizing conventional heavy-duty drilling equipment in good working condition; however, the majority of the very old [paralic deposits were found to be very dense and hard concretions may be encountered. These conditions may result in difficult drilling.

FOUNDATION EXCAVATION OBSERVATION: All footing excavations should be observed by Christian Wheeler Engineering prior to placing of forms and reinforcing steel to determine whether the foundation recommendations presented herein are followed and that the foundation soils are as anticipated in the preparation of this report. All footing excavations should be excavated neat, level, and square. All loose or unsuitable material should be removed prior to the placement of concrete.

SETTLEMENT CHARACTERISTICS: The anticipated total and differential settlement is expected to be less than about 1 inch and 1 inch over 40 feet, respectively, provided the recommendations presented in this report are followed. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to concrete shrinkage during curing or redistribution of stresses, therefore some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

EXPANSIVE CHARACTERISTICS: The prevailing foundation soils are assumed to have a very low expansive potential (EI<20). The recommendations within this report reflect these conditions.

FOUNDATION PLAN REVIEW: The final foundation plan and accompanying details and notes should be submitted to this office for review. The intent of our review will be to verify that the plans used for construction reflect the minimum dimensioning and reinforcing criteria presented in this section and that no additional criteria are required due to changes in the foundation type or layout. It is not our intent to review structural plans, notes, details, or calculations to verify that the design engineer has correctly applied the geotechnical design values. It is the responsibility of the design engineer to properly design/specify the foundations and other structural elements based on the requirements of the structure and considering the information presented in this report.

SOLUBLE SULFATES: The water-soluble sulfate content of a selected soil sample from the site was determined in accordance with California Test Method 417. The results of this test indicate that the soil sample had a soluble sulfate content of 0.006 percent. Soils with a soluble sulfate content of less than 0.1 percent are considered to be negligible. However, it should be recognized that the sulfate content of surficial soils may increase with time due to soluble sulfate in the irrigation water or fertilized use.

SEISMIC DESIGN FACTORS

The seismic design factors applicable to the subject site are provided below. The seismic design factors were determined in accordance with the 2019 California Building Code. The site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters are presented in the following Table I.

TABLE I: SEISMIC DESIGN FACTORS

Site Coordinates: Latitude Longitude	32.952° -117.249°
Site Class	C
Site Coefficient F_a	1.2
Site Coefficient F_v	1.5
Spectral Response Acceleration at Short Periods S_s	1.173 g
Spectral Response Acceleration at 1 Second Period S_1	0.416 g
$S_{MS}=F_aS_s$	1.408 g
$S_{M1}=F_vS_1$	0.624 g
$S_{DS}=2/3*S_{MS}$	0.938 g
$S_{D1}=2/3*S_{M1}$	0.416 g

Probable ground shaking levels at the site could range from slight to moderate, depending on such factors as the magnitude of the seismic event and the distance to the epicenter. It is likely that the site will experience the effects of at least one moderate to large earthquake during the life of the proposed improvements.

ON-GRADE SLABS

GENERAL: It is our understanding that the floor system of the proposed structure will consist of a concrete slab-on-grade. The following recommendations are considered the minimum slab requirements based on the soil conditions and are not intended in lieu of structural considerations. These recommendations assume that the site preparation recommendations contained in this report are implemented.

INTERIOR FLOOR SLABS: The minimum main structure slab thickness should be 5 inches (actual) and the slab should be reinforced with at least No. 4 bars spaced at 18 inches on center each way. This recommendation may have to be revised depending on the extent of site preparation achieved. Slab reinforcement should be supported on chairs such that the reinforcing bars are positioned at mid-height in the floor slab. The slab reinforcement should extend down into the perimeter footings at least 6 inches.

UNDER-SLAB VAPOR RETARDERS: Steps should be taken to minimize the transmission of moisture vapor from the subsoil through the interior slabs where it can potentially damage the interior floor coverings. Local industry standards typically include the placement of a vapor retarder, such as plastic, in a layer of coarse sand placed directly beneath the concrete slab. Two inches of sand are suggested above and below the plastic. The vapor retarder should be at least 15-mil Stegowrap® or similar material with sealed seams and should extend at least 12 inches down the sides of the interior and perimeter footings. The sand should have a sand equivalent of at least 30, and contain less than 10% passing the Number 100 sieve and less than 5% passing the Number 200 sieve. The membrane should be placed in accordance with the recommendation and consideration of ACI 302, "Guide for Concrete Floor and Slab Construction" and ASTM E1643, "Standards Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs." It is the flooring contractor's responsibility to place floor coverings in accordance with the flooring manufacturer specifications.

EXTERIOR CONCRETE FLATWORK: Exterior concrete slabs on grade should have a minimum thickness of 4 inches and be reinforced with at least No. 3 bars placed at 18 inches on center each way (ocew). Driveway slabs should have a minimum thickness of 5 inches and be reinforced with at least No. 4 bars placed at 18 inches ocew. Driveway slabs should be provided with a thickened edge a least 12 inches deep and 6 inches wide. All slabs should be provided with weakened plane joints in accordance with the American Concrete Institute (ACI) guidelines. Special attention should be paid to the method of concrete curing to reduce the potential for excessive shrinkage cracking. It should be recognized that minor cracks occur normally in concrete slabs due to shrinkage. Some shrinkage cracks should be expected and are not necessarily an indication of excessive movement or structural distress.

EARTH RETAINING WALLS

FOUNDATIONS: Foundations for any proposed retaining walls should be constructed in accordance with the foundation recommendations presented previously in this report.

PASSIVE PRESSURE: The passive pressure for the anticipated foundation soils may be considered to be 300 pounds per square foot per foot of depth. The upper foot of embedment should be neglected when calculating passive pressures, unless the foundation abuts a hard surface such as a concrete slab. The passive pressure may be increased by one-third for seismic loading. The coefficient of friction for concrete to soil may be assumed to be 0.30 for the resistance to lateral movement. When combining frictional and passive resistance, the friction should be reduced by one-third.

ACTIVE PRESSURE: The active soil pressure for the design of "unrestrained" and "restrained" earth retaining structures with level backfill may be assumed to be equivalent to the pressure of a fluid weighing 40 and 61 pounds per cubic foot, respectively. These pressures do not consider any other surcharge. If any are anticipated, this office should be contacted for the necessary increase in soil pressure. These values are based on a drained backfill condition.

Seismic lateral earth pressures may be assumed to equal an inverted triangle starting at the bottom of the wall with the maximum pressure equal to 14.5H pounds per square foot (where H = wall height in feet) occurring at the top of the wall.

WATERPROOFING AND WALL DRAINAGE SYSTEMS: The need for waterproofing should be evaluated by others. If required, the project architect should provide (or coordinate) waterproofing details for the retaining walls. The design values presented above are based on a drained backfill condition and do not consider hydrostatic pressures. The retaining wall designer should provide a detail for a wall drainage system. Typical retaining wall drain system details are presented as Plate No. 5 of this report for informational purposes. Additionally, outlet points for the retaining wall drain system should be coordinated with the project civil engineer.

BACKFILL: Retaining wall backfill soils should be compacted to at least 90 percent relative compaction. Retaining wall backfill soils underlying the proposed structure should be compacted to at least 95 percent relative compaction. Expansive or clayey soils should not be used for backfill material. The wall should not be backfilled until the masonry has reached an adequate strength. If gravel is used for backfill, it should be wrapped in filter fabric and capped with at least 24 inches of compacted fill.

LIMITATIONS

REVIEW, OBSERVATION AND TESTING

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the geotechnical engineer and engineering geologist so that they may review and verify their compliance with this report and with the California Building Code.

It is recommended that Christian Wheeler Engineering be retained to provide continuous soil engineering services during the earthwork operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

UNIFORMITY OF CONDITIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the geotechnical engineer so that he may make modifications if necessary.

CHANGE IN SCOPE

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. This should be verified in writing or modified by a written addendum.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or

adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

PROFESSIONAL STANDARD

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made, and that our data, interpretations, and recommendations be based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

CLIENT'S RESPONSIBILITY

It is the responsibility of the Client, or his representatives, to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to ensure that the contractor and his subcontractors carry out such recommendations during construction.

FIELD EXPLORATIONS

Two subsurface explorations were excavated on February 20, 2020 at the locations indicated on the Site Plan and Geotechnical Maps included herewith as Plate No. 1. These explorations consisted of 2 borings drilled utilizing a truck mounted drill rig (Mobile B53). The fieldwork was conducted under the observation and direction of our engineering geology personnel.

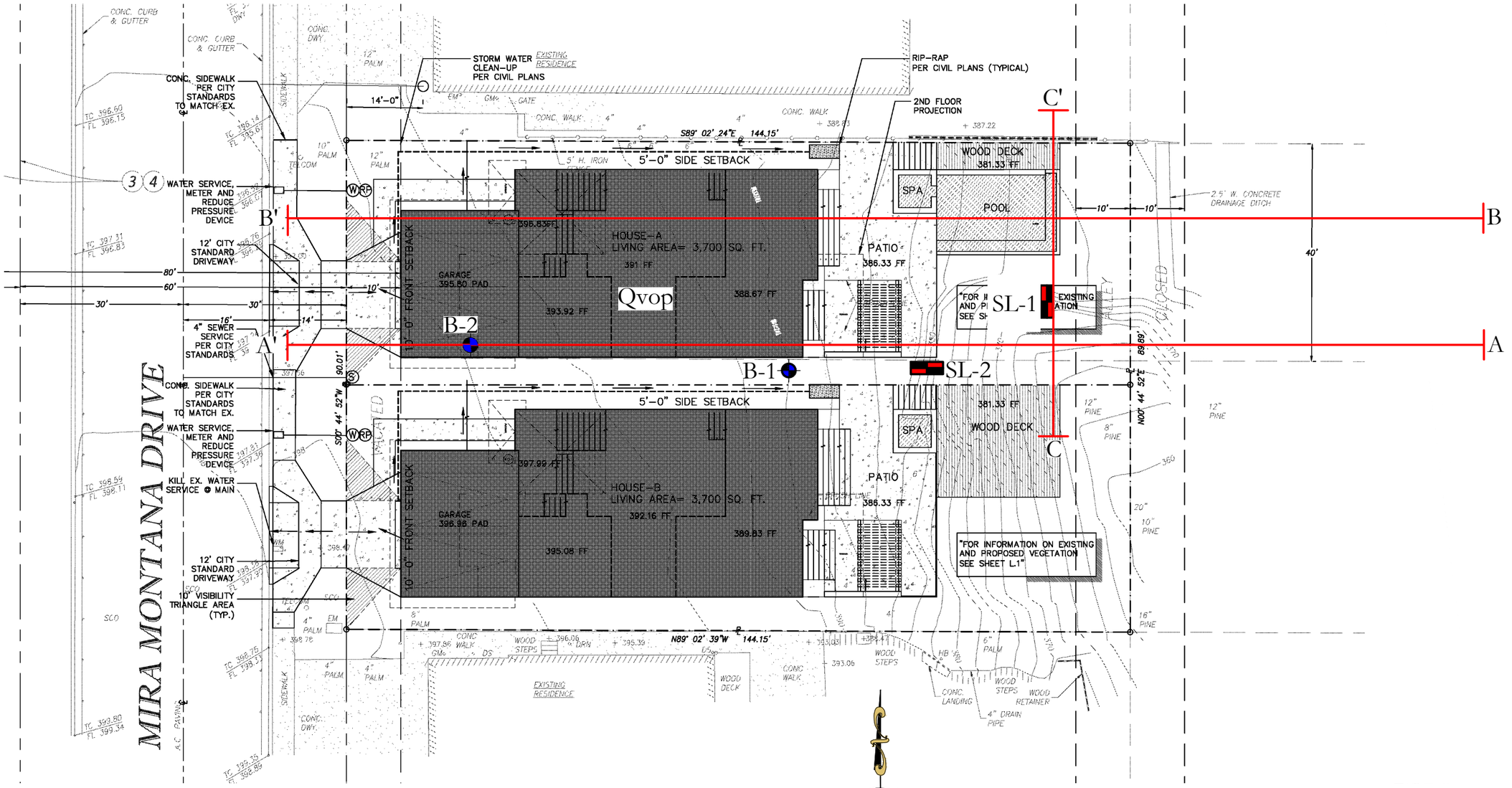
The explorations were carefully logged when made. The logs are presented on Appendix A. The soils are described in accordance with the Unified Soils Classification. In addition, a verbal textural description, the wet color, the apparent moisture, and the density or consistency is provided. The density of granular soils is given as

very loose, loose, medium dense, dense or very dense. The consistency of silts or clays is given as either very soft, soft, medium stiff, stiff, very stiff, or hard.

Relatively undisturbed drive samples were collected using a modified California sampler. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin, brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound hammer falling 30 inches in general accordance with ASTM D 3550-84. The driving weight is permitted to fall freely. The number of blows per foot of driving, or as indicated, are presented on the boring logs as an index to the relative resistance of the sampled materials. The samples were removed from the sample barrel in the brass rings, and sealed. Relatively undisturbed chunk samples and bulk samples of the earth materials encountered were also collected. Samples were transported to our laboratory for testing.

LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed and the subsequent results are presented in Appendix B.



CWE LEGEND	
B-2	Approximate Boring Location
SL-2	Approximate Slope Log Location
Qvop	Very Old Paralic Deposits
	Geologic Cross Section

*Note: Residual Soils Not Mapped

SITE PLAN AND GEOTECHNICAL MAP

VILLA MONTANA HOMES 13995 MIRA MONTANA SAN DIEGO, CALIFORNIA			
DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SRD	PLATE NO.:	1

CHRISTIAN WHEELER ENGINEERING

ALTA DESIGN+DEVELOPMENT
4445 Eastgate Mall Suite 400
San Diego, California 92121
T: 858-362-8800

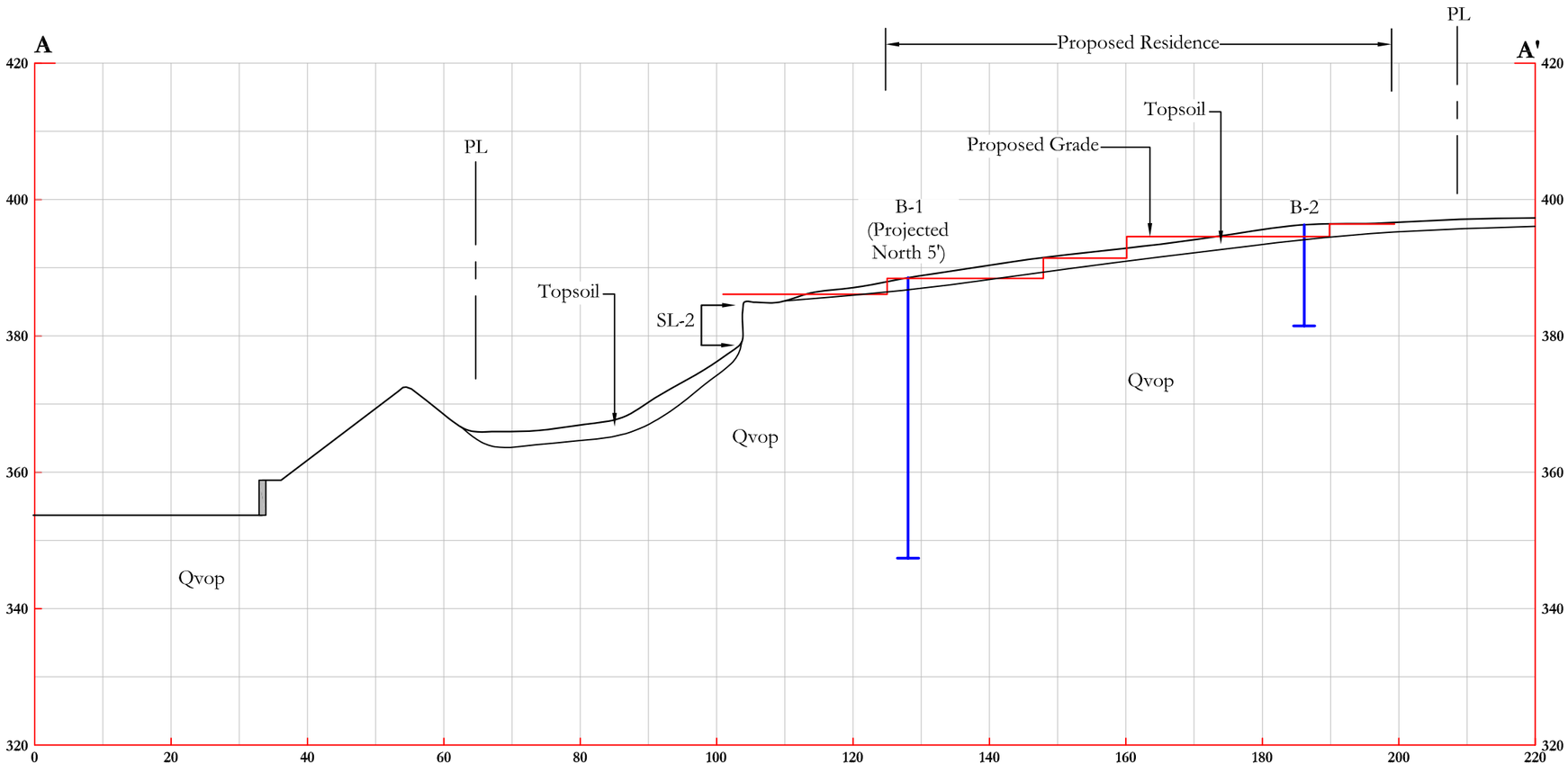
Consultants

Scale: As Shown
Drawn: E. R.
Checked: C. Wellman
Original Date 11/19/19 DCP SUBMITTAL
Revisions:

VILLA MONTANA HOMES
13995 MIRA MONTANA DR.
DEL MAR, CA. 92130

Sheet Title: SITE PLAN

A01.3
03 of 16



0 20' 40'

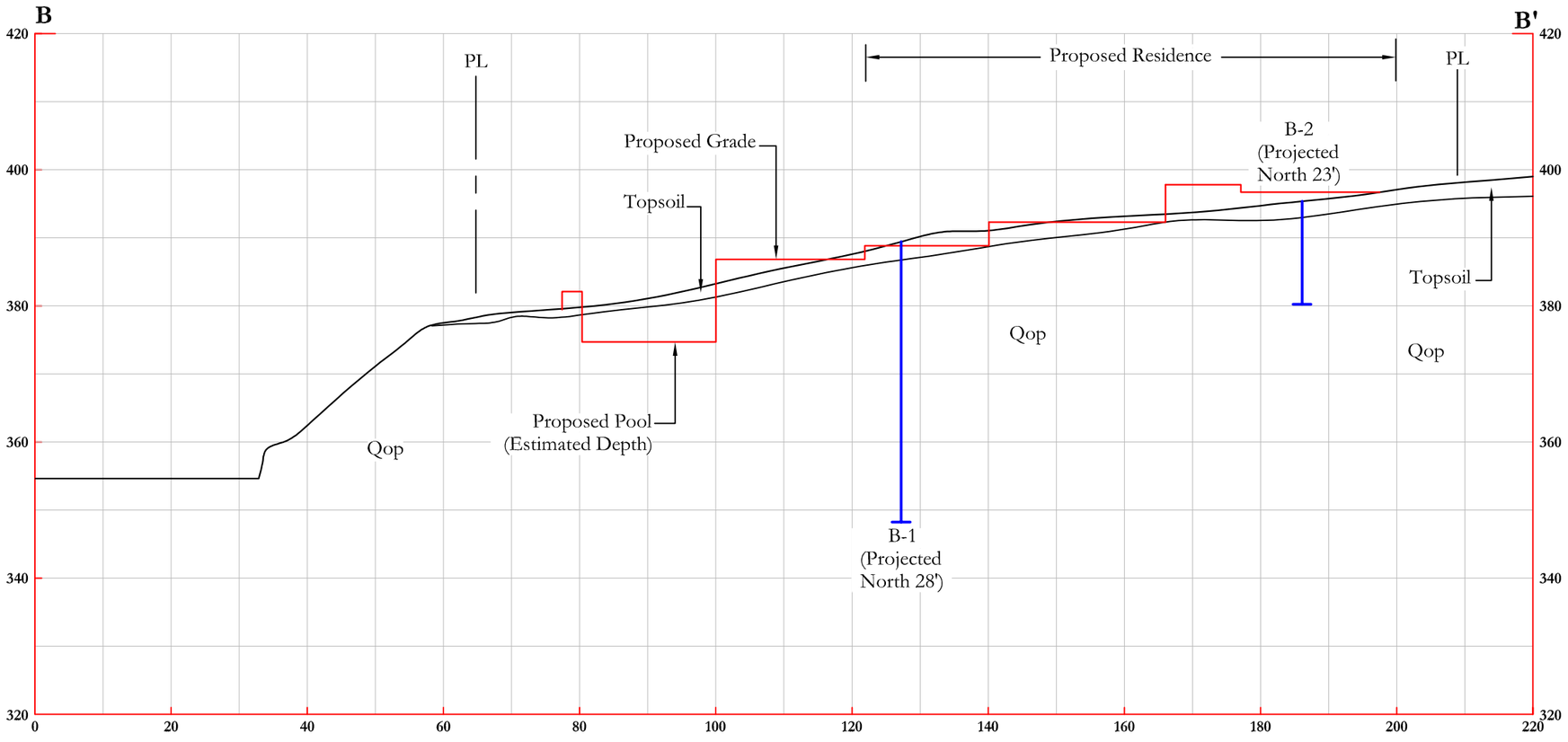
SCALE: 1" = 20'

GEOLOGIC CROSS SECTION A-A'

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SD	PLATE NO.:	2

CHRISTIAN WHEELER
ENGINEERING



0 20' 40'

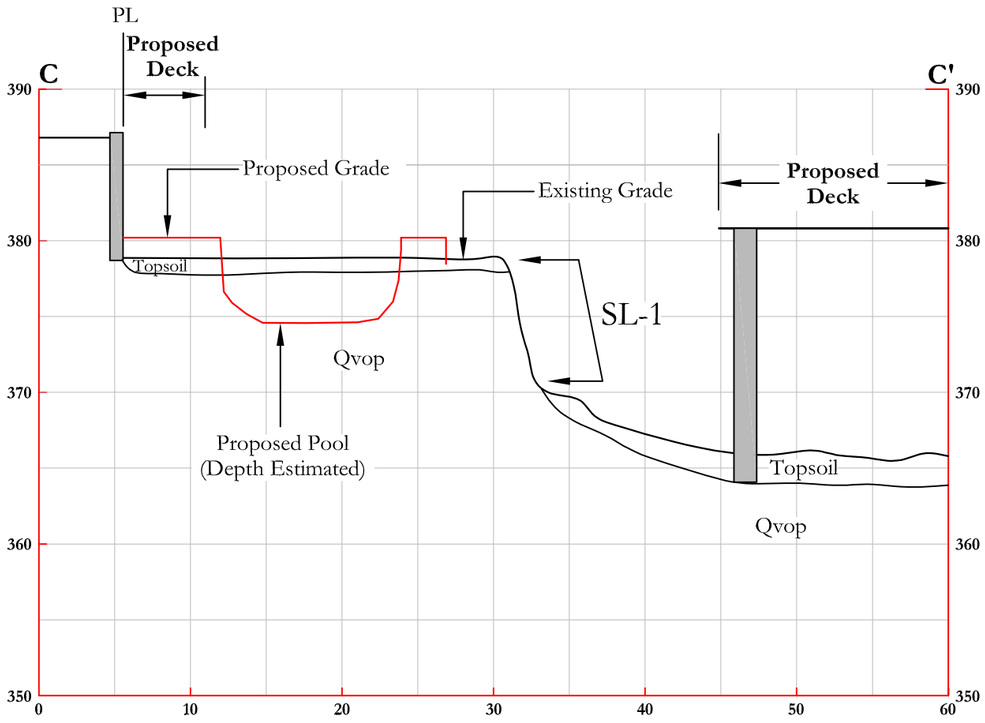
SCALE: 1" = 20'

GEOLOGIC CROSS SECTION B-B'

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SD	PLATE NO.:	3

CHRISTIAN WHEELER
ENGINEERING



0 10' 20'

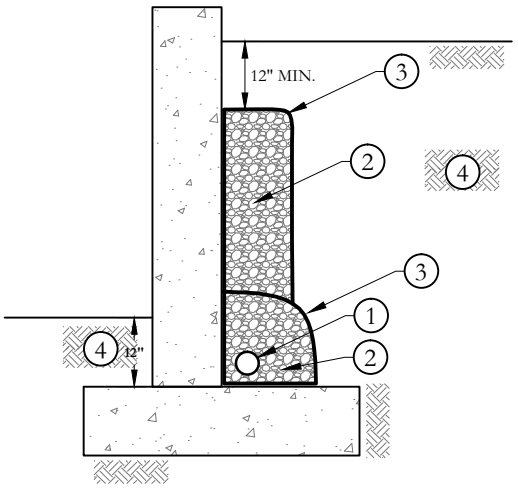
SCALE: 1" = 10'

GEOLOGIC CROSS SECTION C-C'

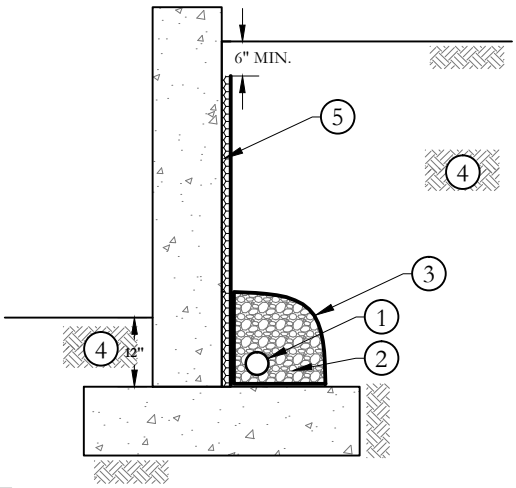
VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SD	PLATE NO.:	4

CHRISTIAN WHEELER
ENGINEERING



1 DETAIL



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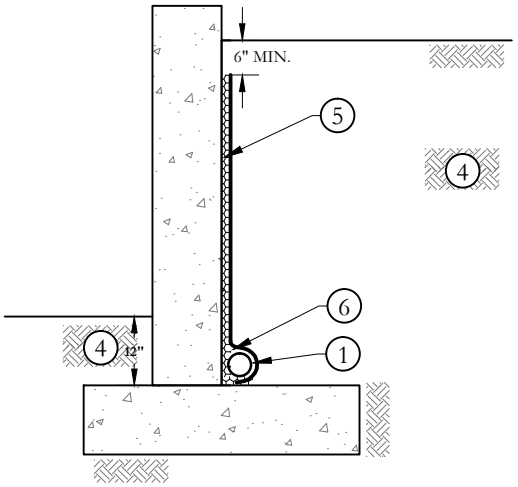
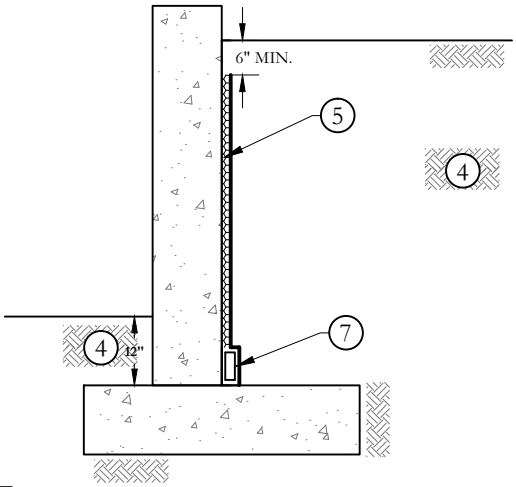


3 DETAIL



4 DETAIL

NOTES AND DETAILS

GENERAL NOTES:

1) THE NEED FOR WATERPROOFING SHOULD BE EVALUATED BY OTHERS.
2) WATERPROOFING TO BE DESIGNED BY OTHERS (CWE CAN PROVIDE A DESIGN IF REQUESTED).
3) EXTEND DRAIN TO SUITABLE DISCHARGE POINT PER CIVIL ENGINEER.
4) DO NOT CONNECT SURFACE DRAINS TO SUBDRAIN SYSTEM.

DETAILS:

1. 4-INCH PERFORATED PVC PIPE ON TOP OF FOOTING, HOLES POSITIONED DOWNWARD (SDR 35, SCHEDULE 40, OR EQUIVALENT).
2. ¾ INCH OPEN-GRADED CRUSHED AGGREGATE.
3. GEOFARBRIC WRAPPED COMPLETELY AROUND ROCK.
4. PROPERLY COMPACTED BACKFILL SOIL.
5. WALL DRAINAGE PANELS (MIRADRAIN OR EQUIVALENT) PLACED PER MANUFACTURER'S REC'S.
6. UNDERLAY SUBDRAIN WITH AND CUT FABRIC BACK FROM DRAINAGE PANELS AND WRAP FABRIC AROUND PIPE.
7. COLLECTION DRAIN (TOTAL DRAIN OR EQUIVALENT) LOCATED AT BASE OF WALL DRAINAGE PANEL PER MANUFACTURER'S RECOMMENDATIONS.

CANTILEVER RETAINING WALL DRAINAGE SYSTEMS

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SRD	PLATE NO.:	5

CHRISTIAN WHEELER
ENGINEERING

Appendix A

Boring Logs

LOG OF TEST BORING B-1

Date Logged:	2/20/20	Equipment:	B-53
Logged By:	DJF	Auger Type:	8 inch Hollow Stem
Existing Elevation:	390'	Drive Type:	140lbs/30 inches
Proposed Elevation:	±388'	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Light brown, dry, loose, very fine- to medium-grained, SILTY SAND with abundant hematite nodules, porous.							
			SM	**Very Old Paralic Deposits (Qvop):** Orangish-brown, damp, dense, very fine- to medium-grained, SILTY SAND, highly weathered with abundant hematite nodules to 3'.	48	Cal		6.7	127.7		
5				Reddish-brown.	50/4"	Cal		8.0	130.3		
				Moist.	50/3"**	Cal*					
10											
15					50/3"	Cal		6.6	123.2		SA
20					50/6"**	Cal*					
				Increase in drilling effort at 21'.							
25					50/3"	Cal					
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SRD	APPENDIX:	A-1

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-1

Date Logged:	2/20/20	Equipment:	B-53
Logged By:	DJF	Auger Type:	8 inch Hollow Stem
Existing Elevation:	390'	Drive Type:	140lbs/30 inches
Proposed Elevation:	±388'	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
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MD	Max Density	DS	Direct Shear
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PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
30			SM	**Very Old Paralic Deposits (Qvop):** Reddish-brown, damp, dense, very fine- to medium-grained, SILTY SAND, highly weathered with abundant hematite nodules to 3'.	50/6"	Cal					
35					50/5"	Cal					DS
40					50/3"	Cal		6.8	115.2		
				Boring terminated at 41 feet. No groundwater or seepage encountered.							
45											
50											
55											
60											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SRD	APPENDIX:	A-2

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-2

Date Logged:	2/20/20	Equipment:	B-53
Logged By:	DJF	Auger Type:	8 inch Hollow Stem
Existing Elevation:	394'	Drive Type:	140lbs/30 inches
Proposed Elevation:	±395'	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Light brown, moist, loose, very fine- to medium-grained, SILTY SAND with abundant hematite nodules.							SA
			SM	**Very Old Paralic Deposits (Qvop):** Orangish-brown, damp, medium dense, very fine- to medium-grained, SILTY SAND, highly weathered to 4' with hematite nodules, porous.	21	Cal		5.7	116.9		SA MD SO4 DS
5				Reddish-brown, dense.	36	Cal					
				Moist, very dense.							
					50/2"	Cal		5.2	111.3		
10											
					50/6"	Cal		7.2	120.3		
15				Boring terminated at 14.5 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁹⁹ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SRD	APPENDIX:	A-3

CHRISTIAN WHEELER ENGINEERING

LOG OF SLOPE SL-1

Date Logged:	2/20/20	Equipment:	Hand tools
Logged By:	DJF	Auger Type:	N/A
Existing Elevation:	378	Drive Type:	N/A
Proposed Elevation:	Unknown	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Light brown, dry, loose, very fine- to medium-grained, SILTY SAND with hematite nodules and animal burrows.							
			SM	**Very Old Paralic Deposits (Qvop):** Reddish-brown, damp, very dense, very fine- to medium-grained, SILTY SAND, massive. Near-vertical exposure.							
5											
				Terminated slope log at toe of erosional exposure.							
10											
15											
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SRD	APPENDIX:	A-4

CHRISTIAN WHEELER ENGINEERING

LOG OF SLOPE SL-2

Date Logged:	2/20/20	Equipment:	Hand tools
Logged By:	DJF	Auger Type:	N/A
Existing Elevation:	384'	Drive Type:	N/A
Proposed Elevation:	Unknown	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Very Old Paralic Deposits (Qvop):** Reddish-brown, damp, very dense, very fine- to medium-grained, SILTY SAND, massive, well-cemented. Overhanging exposure.							
5				Terminated slope log at toe of erosional exposure.							
10											
15											
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁹⁹ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

VILLA MONTANA HOMES
13995 MIRA MONTANA
SAN DIEGO, CALIFORNIA

DATE:	MARCH 2020	JOB NO.:	2200089.02
BY:	SRD	APPENDIX:	A-5

CHRISTIAN WHEELER ENGINEERING

Appendix B

Laboratory Test Results

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System and are presented on the exploration logs in Appendix A.

b) **MOISTURE-DENSITY: MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for selected soil samples in accordance with ATM D 2937. The results are summarized in the boring logs presented in Appendix A.

c) **MAXIMUM DENSITY & OPTIMUM MOISTURE CONTENT:** The maximum dry density and optimum moisture content of typical soils were determined in the laboratory in accordance with ASTM Standard Test D1557, Method A.

d) **DIRECT SHEAR:** Direct shear tests were performed on selected samples of the on-site soils in accordance with ASTM D3080.

e) **GRAIN SIZE DISTRIBUTION:** The grain size distribution of selected samples was determined in accordance with ASTM C136 and/or ASTM D422.

f) **SOLUBLE SULFATE CONTENT:** The soluble sulfate content of a selected sample was determined in accordance with California Test Methods 417.

LABORATORY TEST RESULTS

VILLA MONTANA HOMES

13995 MIRA MONTANA DRIVE

SAN DIEGO, CALIFORNIA

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557)

Sample Location	**Boring B-2 @ 2'-6'**
Sample Description	Reddish-brown Silty Sand (SM)
Maximum Density	135.8 pcf
Optimum Moisture	7.1 %

DIRECT SHEAR (ASTM D3080)

Sample Location	**Boring B-1 @ 36'**	**Boring B-2 @ 2'-6'**	**Boring B-2 @ 5'**
Sample Type	Undisturbed	Remolded to 90%	Undisturbed
Friction Angle	34°	30°	31°
Cohesion	250 psf	200 psf	250 psf

GRAIN SIZE DISTRIBUTION (ASTM D422)

Sample Location	**Boring B-1 @ 15'-20'**	**Boring B-2 @ 0-2'**	**Boring B-2 @ 2'-6'**
Sieve Size	*Percent Passing*	*Percent Passing*	*Percent Passing*
¾"		100	100
½"		77	95
⅜"		68	91
#4		58	86
#8	100	57	83
#16	99	56	82
#30	87	50	71
#50	54	27	44
#100	33	18	31
#200	26	15	26

SOLUBLE SULFATES (CALIFORNIA TEST 417)

Sample Location	**Boring B-2 @ 2'-6'**
Soluble Sulfate	0.006 % (SO_4)

Appendix C

References

REFERENCES

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Bryant, W. A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page, http://www.consrv.ca.gov/CGS/information/publications/QuaternaryFaults_ver2.htm

City of San Diego, 2008, Seismic Hazard Study, Geologic Hazards and Faults, Sheet 38.

City of San Diego, 2018, Guidelines for Geotechnical Reports

Coffey Engineering, Inc., Topographic Survey, Mira Montana, dated September 12, 2019.

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TOPOGRAPHIC MAPS

City of San Diego, 1959, 200-Scale Topographic Map, Sheet 268-1689.

City of San Diego, 1977, 200-Scale Orthographic Map, Sheet 268-1689.

Appendix D

Recommended Grading Specifications – General Provisions

RECOMMENDED GRADING SPECIFICATIONS - GENERAL PROVISIONS

VILLA MONTANA HOMES
13995 MIRA MONTANA DRIVE
SAN DIEGO, CALIFORNIA

GENERAL INTENT

The intent of these specifications is to establish procedures for clearing, compacting natural ground, preparing areas to be filled, and placing and compacting fill soils to the lines and grades shown on the accepted plans. The recommendations contained in the preliminary geotechnical investigation report and/or the attached Special Provisions are a part of the Recommended Grading Specifications and shall supersede the provisions contained hereinafter in the case of conflict. These specifications shall only be used in conjunction with the geotechnical report for which they are a part. No deviation from these specifications will be allowed, except where specified in the geotechnical report or in other written communication signed by the Geotechnical Engineer.

OBSERVATION AND TESTING

Christian Wheeler Engineering shall be retained as the Geotechnical Engineer to observe and test the earthwork in accordance with these specifications. It will be necessary that the Geotechnical Engineer or his representative provide adequate observation so that he may provide his opinion as to whether or not the work was accomplished as specified. It shall be the responsibility of the contractor to assist the Geotechnical Engineer and to keep him appraised of work schedules, changes and new information and data so that he may provide these opinions. In the event that any unusual conditions not covered by the special provisions or preliminary geotechnical report are encountered during the grading operations, the Geotechnical Engineer shall be contacted for further recommendations.

If, in the opinion of the Geotechnical Engineer, substandard conditions are encountered, such as questionable or unsuitable soil, unacceptable moisture content, inadequate compaction, adverse weather, etc., construction should be stopped until the conditions are remedied or corrected or he shall recommend rejection of this work.
Tests used to determine the degree of compaction should be performed in accordance with the following American Society for Testing and Materials test methods:

Maximum Density & Optimum Moisture Content - ASTM D1557
Density of Soil In-Place - ASTM D1556 or ASTM D2922

All densities shall be expressed in terms of Relative Compaction as determined by the foregoing ASTM testing procedures.

PREPARATION OF AREAS TO RECEIVE FILL

All vegetation, brush and debris derived from clearing operations shall be removed, and legally disposed of. All areas disturbed by site grading should be left in a neat and finished appearance, free from unsightly debris.

After clearing or benching the natural ground, the areas to be filled shall be scarified to a depth of 6 inches, brought to the proper moisture content, compacted and tested for the specified minimum degree of compaction. All loose soils in excess of 6 inches thick should be removed to firm natural ground which is defined as natural soil which possesses an in-situ density of at least 90 percent of its maximum dry density.

When the slope of the natural ground receiving fill exceeds 20 percent (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to a firm competent formational soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than two (2) percent. All other benches should be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as specified herein for compacted natural ground. Ground slopes flatter than 20 percent shall be benched when considered necessary by the Geotechnical Engineer.

Any abandoned buried structures encountered during grading operations must be totally removed. All underground utilities to be abandoned beneath any proposed structure should be removed from within 10 feet of the structure and properly capped off. The resulting depressions from the above described procedure should be backfilled with acceptable soil that is compacted to the requirements of the Geotechnical Engineer. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains and water lines. Any buried structures or utilities not to be abandoned should be brought to the attention of the Geotechnical Engineer so that he may determine if any special recommendation will be necessary.

All water wells which will be abandoned should be backfilled and capped in accordance to the requirements set forth by the Geotechnical Engineer. The top of the cap should be at least 4 feet below finish grade or 3

feet below the bottom of footing whichever is greater. The type of cap will depend on the diameter of the well and should be determined by the Geotechnical Engineer and/or a qualified Structural Engineer.

FILL MATERIAL

Materials to be placed in the fill shall be approved by the Geotechnical Engineer and shall be free of vegetable matter and other deleterious substances. Granular soil shall contain sufficient fine material to fill the voids. The definition and disposition of oversized rocks and expansive or detrimental soils are covered in the geotechnical report or Special Provisions. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils to provide satisfactory fill material, but only with the explicit consent of the Geotechnical Engineer. Any import material shall be approved by the Geotechnical Engineer before being brought to the site.

PLACING AND COMPACTION OF FILL

Approved fill material shall be placed in areas prepared to receive fill in layers not to exceed 6 inches in compacted thickness. Each layer shall have a uniform moisture content in the range that will allow the compaction effort to be efficiently applied to achieve the specified degree of compaction. Each layer shall be uniformly compacted to the specified minimum degree of compaction with equipment of adequate size to economically compact the layer. Compaction equipment should either be specifically designed for soil compaction or of proven reliability. The minimum degree of compaction to be achieved is specified in either the Special Provisions or the recommendations contained in the preliminary geotechnical investigation report. When the structural fill material includes rocks, no rocks will be allowed to nest and all voids must be carefully filled with soil such that the minimum degree of compaction recommended in the Special Provisions is achieved. The maximum size and spacing of rock permitted in structural fills and in non-structural fills is discussed in the geotechnical report, when applicable.

Field observation and compaction tests to estimate the degree of compaction of the fill will be taken by the Geotechnical Engineer or his representative. The location and frequency of the tests shall be at the Geotechnical Engineer's discretion. When the compaction test indicates that a particular layer is at less than the required degree of compaction, the layer shall be reworked to the satisfaction of the Geotechnical Engineer and until the desired relative compaction has been obtained.

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction by sheepsfoot roller shall be at vertical intervals of not greater than four feet. In addition, fill slopes at a ratio of

two horizontal to one vertical or flatter, should be trackrolled. Steeper fill slopes shall be over-built and cut-back to finish contours after the slope has been constructed. Slope compaction operations shall result in all fill material six or more inches inward from the finished face of the slope having a relative compaction of at least 90 percent of maximum dry density or the degree of compaction specified in the Special Provisions section of this specification. The compaction operation on the slopes shall be continued until the Geotechnical Engineer is of the opinion that the slopes will be surficially stable.

Density tests in the slopes will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified that day of such conditions by written communication from the Geotechnical Engineer or his representative in the form of a daily field report.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no cost to the Owner or Geotechnical Engineer.

CUT SLOPES

The Engineering Geologist shall inspect cut slopes excavated in rock or lithified formational material during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer to determine if mitigating measures are necessary.

Unless otherwise specified in the geotechnical report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agency.

ENGINEERING OBSERVATION

Field observation by the Geotechnical Engineer or his representative shall be made during the filling and compaction operations so that he can express his opinion regarding the conformance of the grading with acceptable standards of practice. Neither the presence of the Geotechnical Engineer or his representative or

the observation and testing shall release the Grading Contractor from his duty to compact all fill material to the specified degree of compaction.

SEASON LIMITS

Fill shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rain, filling operations shall not be resumed until the proper moisture content and density of the fill materials can be achieved. Damaged site conditions resulting from weather or acts of God shall be repaired before acceptance of work.

RECOMMENDED GRADING SPECIFICATIONS - SPECIAL PROVISIONS

RELATIVE COMPACTION: The minimum degree of compaction to be obtained in compacted natural ground, compacted fill, and compacted backfill shall be at least 90 percent. For street and parking lot subgrade, the upper six inches should be compacted to at least 95 percent relative compaction.

EXPANSIVE SOILS: Detrimentally expansive soil is defined as clayey soil which has an expansion index of 50 or greater when tested in accordance with the Uniform Building Code Standard 29-2.

OVERSIZED MATERIAL: Oversized fill material is generally defined herein as rocks or lumps of soil over 6 inches in diameter. Oversized materials should not be placed in fill unless recommendations of placement of such material are provided by the Geotechnical Engineer. At least 40 percent of the fill soils shall pass through a No. 4 U.S. Standard Sieve.

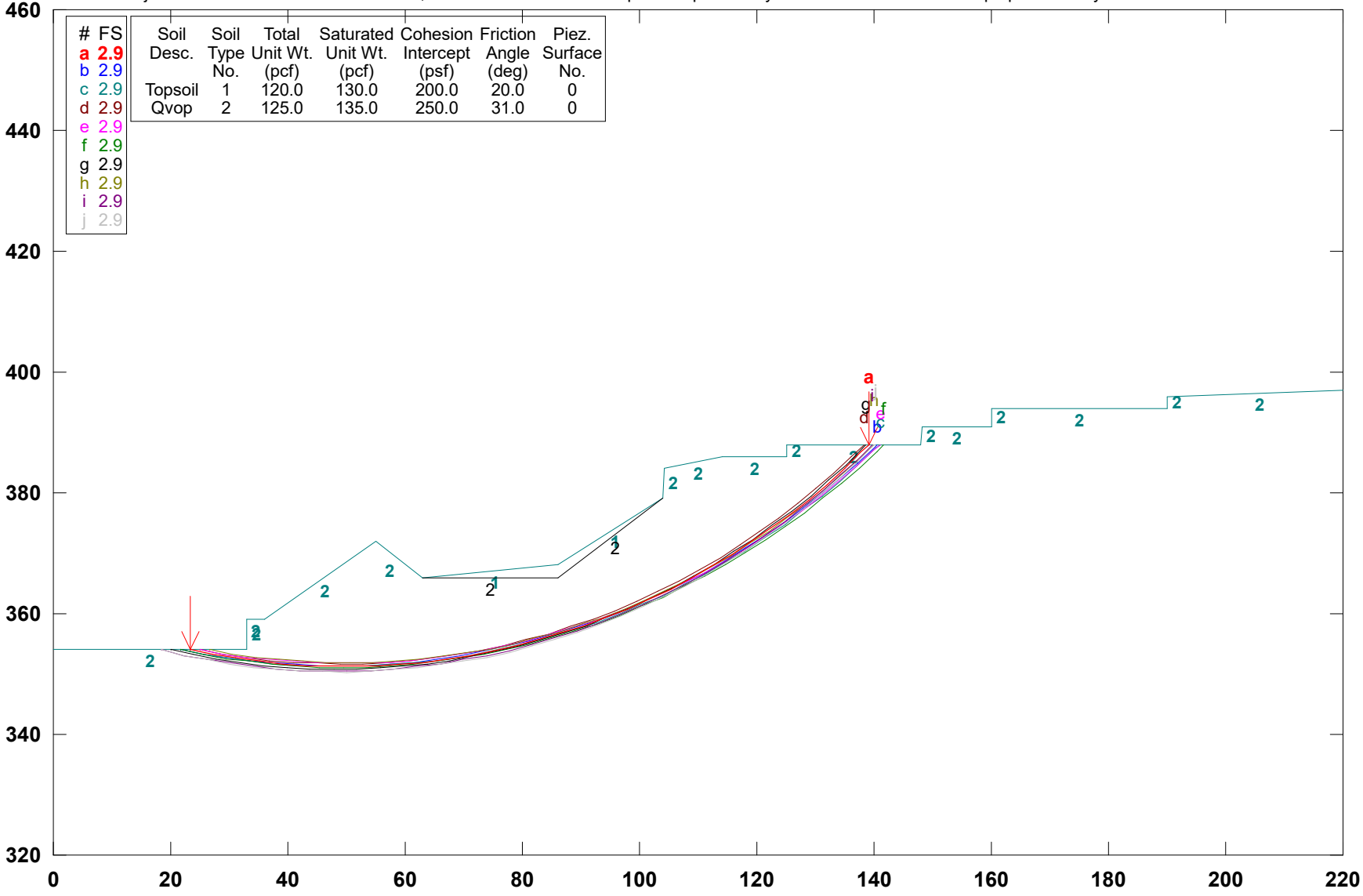
TRANSITION LOTS: Where transitions between cut and fill occur within the proposed building pad, the cut portion should be undercut a minimum of one foot below the base of the proposed footings and recompacted as structural backfill. In certain cases that would be addressed in the geotechnical report, special footing reinforcement or a combination of special footing reinforcement and undercutting may be required.

APPENDIX E

Gross Slope Stability

Villa Montana Homes 2200089 A-A' Circular Lower Slope

w:\2020 jobs\2200089 - villa montana homes, 13995 mira montana dr\reports\slope stability\a-a' circular static lower slope.pl2 Run By: DJF 3/25/2020 03:44PM



#	FS
a	2.9
b	2.9
c	2.9
d	2.9
e	2.9
f	2.9
g	2.9
h	2.9
i	2.9
j	2.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Topsoil	1	120.0	130.0	200.0	20.0	0
Qvop	2	125.0	135.0	250.0	31.0	0

GSTABL7 v.2 FSmin=2.9

Safety Factors Are Calculated By The Modified Bishop Method

CHRISTIAN WHEELER ENGINEERING

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 3/25/2020
Time of Run: 03:44PM
Run By: DJF
Input Data Filename: w:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular static lower slope.in
Output Filename: w:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular static lower slope.OUT
Unit System: English
Plotted Output Filename: w:\2020 Jobs\2200089 - Villa Mon Homes, 13995 Mira Montana D
r\Reports\Slope Stability\a-a' circular static lower slope.PLT
PROBLEM DESCRIPTION: Villa Montana Homes
2200089 A-A' Circular Lower Slope

BOUNDARY COORDINATES
18 Top Boundaries
20 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	354.00	33.00	354.00	2
2	33.00	354.00	33.10	359.00	2
3	33.10	359.00	36.00	359.00	2
4	36.00	359.00	55.00	372.00	2
5	55.00	372.00	63.00	366.00	2
6	63.00	366.00	86.00	368.00	1
7	86.00	368.00	104.00	379.00	1
8	104.00	379.00	104.10	384.00	2
9	104.10	384.00	114.00	386.00	2
10	114.00	386.00	125.00	386.00	2
11	125.00	386.00	125.10	388.00	2
12	125.10	388.00	148.00	388.00	2
13	148.00	388.00	148.10	391.00	2
14	148.10	391.00	160.00	391.00	2
15	160.00	391.00	160.10	394.00	2
16	160.10	394.00	190.00	394.00	2
17	190.00	394.00	190.10	396.00	2
18	190.10	396.00	220.00	397.00	2
19	63.00	366.00	86.00	366.00	2
20	86.00	366.00	104.00	379.00	2

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	130.0	200.0	20.0	0.00	0.0	0
2	125.0	135.0	250.0	31.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 15.00(ft)
and X = 30.00(ft)
Each Surface Terminates Between X = 135.00(ft)
and X = 150.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)

4.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 4.227 FS Min = 2.924 FS Ave = 3.469
Standard Deviation = 0.388 Coefficient of Variation = 11.20 %
Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.33	354.00
2	27.26	353.24
3	31.21	352.60
4	35.18	352.08
5	39.16	351.69
6	43.15	351.43
7	47.14	351.29
8	51.14	351.27
9	55.14	351.39
10	59.14	351.62
11	63.12	351.98
12	67.09	352.47
13	71.04	353.08
14	74.98	353.82
15	78.88	354.67
16	82.76	355.65
17	86.61	356.76
18	90.41	357.98
19	94.18	359.32
20	97.91	360.78
21	101.59	362.35
22	105.21	364.04
23	108.78	365.84
24	112.30	367.75
25	115.75	369.77
26	119.13	371.90
27	122.45	374.14
28	125.70	376.48
29	128.87	378.91
30	131.96	381.45
31	134.97	384.08
32	137.90	386.81
33	139.10	388.00

Circle Center At X = 49.60 ; Y = 478.72 ; and Radius = 127.46
Factor of Safety
*** 2.924 ***
Individual data on the 43 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.9	187.2	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.9	534.2	0.0	0.0	0.	0.	0.0	0.0	0.0
3	1.8	340.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	0.1	51.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	2.1	1759.3	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.8	717.2	0.0	0.0	0.	0.	0.0	0.0	0.0
7	3.2	3247.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	4.0	5470.1	0.0	0.0	0.	0.	0.0	0.0	0.0
9	4.0	6945.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	4.0	8356.3	0.0	0.0	0.	0.	0.0	0.0	0.0
11	3.9	9326.1	0.0	0.0	0.	0.	0.0	0.0	0.0
12	0.1	368.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	4.0	9429.1	0.0	0.0	0.	0.	0.0	0.0	0.0
14	3.9	7558.8	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.1	210.3	0.0	0.0	0.	0.	0.0	0.0	0.0
16	4.0	6922.3	0.0	0.0	0.	0.	0.0	0.0	0.0
17	4.0	6784.4	0.0	0.0	0.	0.	0.0	0.0	0.0

18	3.9	6579.2	0.0	0.0	0.	0.	0.0	0.0	0.0
19	3.9	6308.2	0.0	0.0	0.	0.	0.0	0.0	0.0
20	3.9	5973.8	0.0	0.0	0.	0.	0.0	0.0	0.0
21	3.2	4724.5	0.0	0.0	0.	0.	0.0	0.0	0.0
22	0.6	865.9	0.0	0.0	0.	0.	0.0	0.0	0.0
23	3.8	5760.4	0.0	0.0	0.	0.	0.0	0.0	0.0
24	3.8	6195.0	0.0	0.0	0.	0.	0.0	0.0	0.0
25	3.7	6545.2	0.0	0.0	0.	0.	0.0	0.0	0.0
26	3.7	6812.0	0.0	0.0	0.	0.	0.0	0.0	0.0
27	2.4	4631.3	0.0	0.0	0.	0.	0.0	0.0	0.0
28	0.1	225.0	0.0	0.0	0.	0.	0.0	0.0	0.0
29	1.1	2825.4	0.0	0.0	0.	0.	0.0	0.0	0.0
30	3.6	8770.4	0.0	0.0	0.	0.	0.0	0.0	0.0
31	3.5	8126.0	0.0	0.0	0.	0.	0.0	0.0	0.0
32	1.7	3743.8	0.0	0.0	0.	0.	0.0	0.0	0.0
33	1.7	3655.5	0.0	0.0	0.	0.	0.0	0.0	0.0
34	3.4	6417.0	0.0	0.0	0.	0.	0.0	0.0	0.0
35	3.3	5382.4	0.0	0.0	0.	0.	0.0	0.0	0.0
36	2.5	3487.0	0.0	0.0	0.	0.	0.0	0.0	0.0
37	0.1	137.4	0.0	0.0	0.	0.	0.0	0.0	0.0
38	0.6	875.8	0.0	0.0	0.	0.	0.0	0.0	0.0
39	3.2	4084.5	0.0	0.0	0.	0.	0.0	0.0	0.0
40	3.1	3022.2	0.0	0.0	0.	0.	0.0	0.0	0.0
41	3.0	1970.0	0.0	0.0	0.	0.	0.0	0.0	0.0
42	2.9	934.6	0.0	0.0	0.	0.	0.0	0.0	0.0
43	1.2	89.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.67	354.00
2	25.60	353.27
3	29.55	352.66
4	33.52	352.16
5	37.50	351.78
6	41.49	351.52
7	45.49	351.38
8	49.49	351.36
9	53.49	351.46
10	57.49	351.67
11	61.47	352.00
12	65.45	352.46
13	69.41	353.03
14	73.35	353.71
15	77.26	354.52
16	81.16	355.43
17	85.02	356.47
18	88.85	357.62
19	92.65	358.88
20	96.41	360.25
21	100.12	361.74
22	103.79	363.33
23	107.41	365.03
24	110.98	366.84
25	114.49	368.76
26	117.94	370.77
27	121.33	372.89
28	124.66	375.11
29	127.92	377.43
30	131.11	379.84
31	134.23	382.35
32	137.27	384.95
33	140.24	387.63
34	140.62	388.00

Circle Center At X = 48.24 ; Y = 486.10 ; and Radius = 134.75

Factor of Safety

*** 2.925 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.67	354.00

2	25.60	353.25
3	29.55	352.62
4	33.51	352.11
5	37.49	351.71
6	41.48	351.44
7	45.48	351.28
8	49.48	351.24
9	53.48	351.32
10	57.47	351.52
11	61.46	351.84
12	65.44	352.28
13	69.40	352.84
14	73.34	353.51
15	77.26	354.30
16	81.16	355.21
17	85.03	356.23
18	88.86	357.37
19	92.66	358.62
20	96.42	359.98
21	100.14	361.45
22	103.81	363.04
23	107.44	364.73
24	111.01	366.53
25	114.53	368.43
26	117.99	370.44
27	121.38	372.56
28	124.72	374.77
29	127.98	377.08
30	131.18	379.48
31	134.30	381.98
32	137.35	384.57
33	140.32	387.25
34	141.09	388.00

Circle Center At X = 48.76 ; Y = 485.58 ; and Radius = 134.34

Factor of Safety

*** 2.925 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.94	353.31
3	32.90	352.74
4	36.87	352.29
5	40.86	351.97
6	44.86	351.77
7	48.85	351.70
8	52.85	351.75
9	56.85	351.93
10	60.84	352.24
11	64.82	352.67
12	68.78	353.22
13	72.72	353.90
14	76.64	354.70
15	80.53	355.62
16	84.39	356.66
17	88.22	357.83
18	92.01	359.11
19	95.75	360.51
20	99.46	362.03
21	103.11	363.66
22	106.71	365.41
23	110.25	367.27
24	113.73	369.23
25	117.15	371.31
26	120.50	373.49
27	123.78	375.78
28	126.99	378.17
29	130.12	380.66
30	133.18	383.24
31	136.15	385.92

32	138.32	388.00

Circle Center At X = 49.14 ; Y = 479.38 ; and Radius = 127.68

Factor of Safety

*** 2.925 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.94	353.34
3	32.91	352.79
4	36.88	352.36
5	40.87	352.06
6	44.87	351.87
7	48.87	351.79
8	52.87	351.84
9	56.86	352.01
10	60.85	352.29
11	64.83	352.70
12	68.80	353.22
13	72.75	353.86
14	76.68	354.61
15	80.58	355.49
16	84.46	356.47
17	88.30	357.58
18	92.11	358.79
19	95.88	360.12
20	99.61	361.56
21	103.30	363.11
22	106.94	364.77
23	110.53	366.54
24	114.06	368.41
25	117.54	370.39
26	120.96	372.47
27	124.31	374.65
28	127.60	376.93
29	130.82	379.31
30	133.96	381.78
31	137.03	384.34
32	140.03	386.99
33	141.10	388.00

Circle Center At X = 49.27 ; Y = 486.40 ; and Radius = 134.61

Factor of Safety

*** 2.925 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.67	354.00
2	25.59	353.23
3	29.54	352.59
4	33.50	352.06
5	37.48	351.65
6	41.47	351.35
7	45.47	351.18
8	49.47	351.13
9	53.47	351.19
10	57.46	351.38
11	61.45	351.68
12	65.43	352.11
13	69.39	352.65
14	73.34	353.31
15	77.26	354.09
16	81.16	354.98
17	85.03	355.99
18	88.87	357.12
19	92.67	358.36
20	96.44	359.71
21	100.16	361.17
22	103.84	362.75
23	107.47	364.43
24	111.04	366.22

25	114.56	368.12
26	118.03	370.12
27	121.43	372.22
28	124.77	374.43
29	128.04	376.73
30	131.24	379.13
31	134.37	381.62
32	137.42	384.21
33	140.39	386.89
34	141.56	388.00

Circle Center At X = 49.26 ; Y = 485.07 ; and Radius = 133.94

Factor of Safety

*** 2.926 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.00	354.00
2	23.91	353.17
3	27.85	352.47
4	31.81	351.88
5	35.78	351.42
6	39.77	351.09
7	43.76	350.88
8	47.76	350.80
9	51.76	350.84
10	55.76	351.01
11	59.75	351.30
12	63.73	351.72
13	67.69	352.26
14	71.63	352.92
15	75.55	353.71
16	79.45	354.62
17	83.31	355.65
18	87.14	356.80
19	90.94	358.08
20	94.69	359.47
21	98.39	360.97
22	102.05	362.59
23	105.65	364.33
24	109.20	366.18
25	112.69	368.13
26	116.12	370.20
27	119.47	372.37
28	122.76	374.65
29	125.98	377.02
30	129.12	379.50
31	132.18	382.08
32	135.16	384.74
33	138.06	387.51
34	138.54	388.00

Circle Center At X = 48.43 ; Y = 478.54 ; and Radius = 127.74

Factor of Safety

*** 2.926 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.61	353.34
3	34.58	352.80
4	38.55	352.38
5	42.54	352.09
6	46.54	351.92
7	50.54	351.87
8	54.54	351.94
9	58.53	352.14
10	62.52	352.46
11	66.50	352.91
12	70.45	353.48
13	74.39	354.16
14	78.31	354.97

15	82.20	355.90
16	86.06	356.95
17	89.89	358.12
18	93.68	359.41
19	97.42	360.81
20	101.12	362.33
21	104.78	363.96
22	108.38	365.70
23	111.92	367.55
24	115.41	369.51
25	118.83	371.58
26	122.19	373.75
27	125.48	376.02
28	128.70	378.40
29	131.85	380.87
30	134.91	383.44
31	137.90	386.10
32	139.90	388.00

Circle Center At X = 50.09 ; Y = 481.55 ; and Radius = 129.68

Factor of Safety

*** 2.926 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.33	354.00
2	22.24	353.14
3	26.17	352.40
4	30.12	351.77
5	34.09	351.28
6	38.07	350.90
7	42.06	350.65
8	46.06	350.52
9	50.06	350.51
10	54.06	350.62
11	58.05	350.86
12	62.04	351.23
13	66.01	351.71
14	69.96	352.32
15	73.89	353.04
16	77.80	353.89
17	81.68	354.86
18	85.53	355.95
19	89.35	357.15
20	93.12	358.47
21	96.86	359.91
22	100.54	361.46
23	104.18	363.13
24	107.76	364.90
25	111.29	366.79
26	114.76	368.78
27	118.17	370.88
28	121.50	373.08
29	124.77	375.39
30	127.97	377.79
31	131.09	380.29
32	134.13	382.89
33	137.10	385.58
34	139.60	388.00

Circle Center At X = 48.30 ; Y = 480.39 ; and Radius = 129.89

Factor of Safety

*** 2.927 ***

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.33	354.00
2	22.24	353.12
3	26.16	352.36
4	30.11	351.73
5	34.08	351.21
6	38.06	350.82

7	42.05	350.55
8	46.05	350.40
9	50.05	350.38
10	54.05	350.48
11	58.04	350.70
12	62.02	351.05
13	66.00	351.52
14	69.95	352.11
15	73.89	352.83
16	77.80	353.66
17	81.69	354.62
18	85.54	355.69
19	89.36	356.88
20	93.14	358.19
21	96.87	359.62
22	100.56	361.16
23	104.21	362.81
24	107.80	364.58
25	111.33	366.45
26	114.80	368.43
27	118.21	370.52
28	121.56	372.72
29	124.84	375.01
30	128.04	377.41
31	131.17	379.90
32	134.22	382.49
33	137.18	385.17
34	140.07	387.94
35	140.13	388.00

Circle Center At X = 48.79 ; Y = 480.05 ; and Radius = 129.68

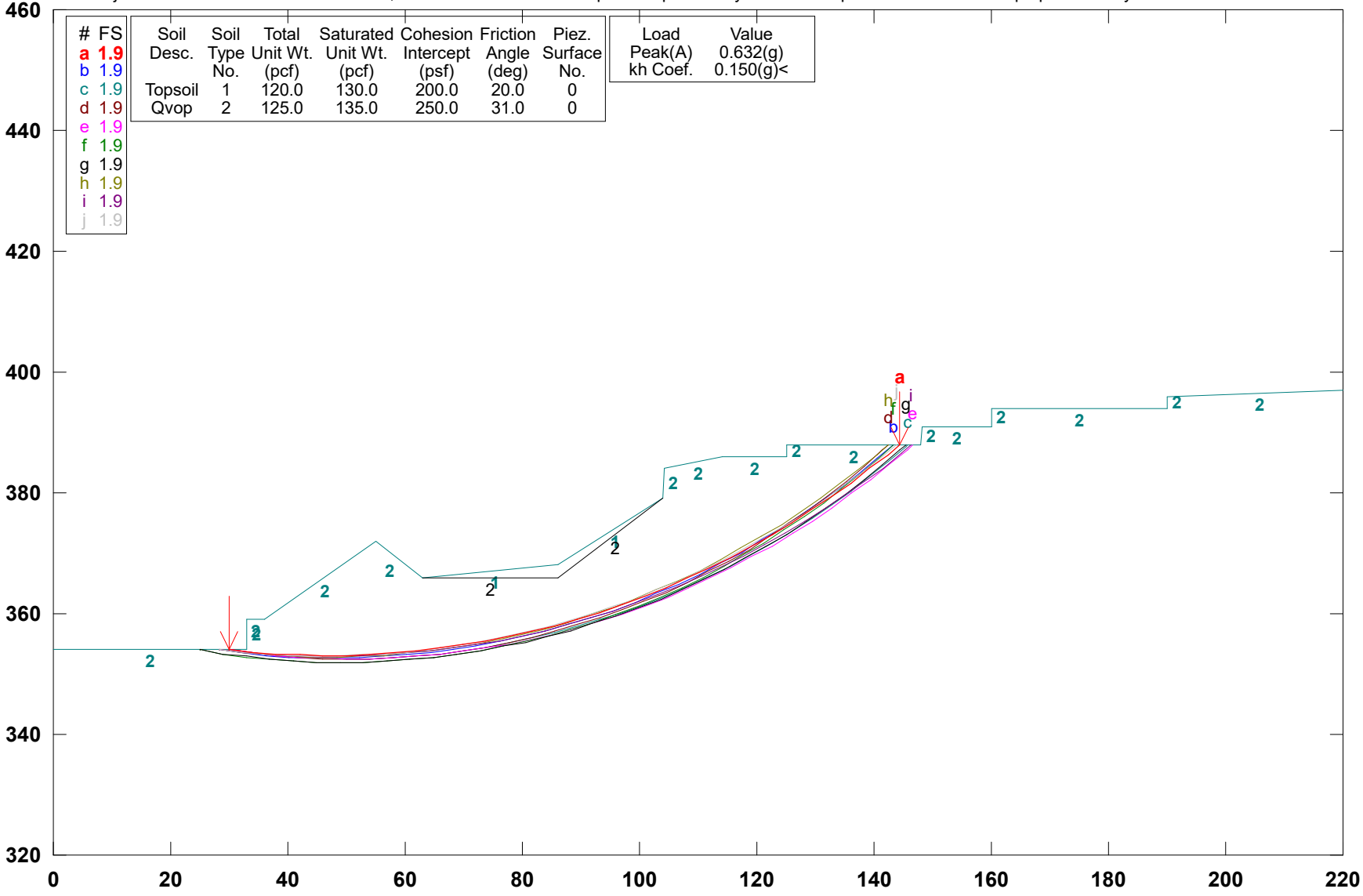
Factor of Safety

*** 2.927 ***

**** END OF GSTABL7 OUTPUT ****

Villa Montana Homes 2200089 A-A' Pseudo Static Lower Slope

w:\2020 jobs\2200089 - villa montana homes, 13995 mira montana dr\reports\slope stability\a-a' circular pseudo static lower slope.pl2 Run By: DJF 3/25/2020 05:08PM



#	FS
a	1.9
b	1.9
c	1.9
d	1.9
e	1.9
f	1.9
g	1.9
h	1.9
i	1.9
j	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Topsoil	1	120.0	130.0	200.0	20.0	0
Qvop	2	125.0	135.0	250.0	31.0	0

Load	Value
Peak(A)	0.632(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.9

Safety Factors Are Calculated By The Modified Bishop Method

CHRISTIAN WHEELER ENGINEERING

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 3/25/2020
Time of Run: 05:08PM
Run By: DJF
Input Data Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular pseudo static lower slope.in
Output Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular pseudo static lower slope.OUT
Unit System: English
Plotted Output Filename: W:\2020 Jobs\2200089 - Villa Mon Homes, 13995 Mira Montana D
r\Reports\Slope Stability\a-a' circular pseudo static lower slope.PLT
PROBLEM DESCRIPTION: Villa Montana Homes
2200089 A-A' Pseudo Static Lower Slope

BOUNDARY COORDINATES
18 Top Boundaries
20 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	354.00	33.00	354.00	2
2	33.00	354.00	33.10	359.00	2
3	33.10	359.00	36.00	359.00	2
4	36.00	359.00	55.00	372.00	2
5	55.00	372.00	63.00	366.00	2
6	63.00	366.00	86.00	368.00	1
7	86.00	368.00	104.00	379.00	1
8	104.00	379.00	104.10	384.00	2
9	104.10	384.00	114.00	386.00	2
10	114.00	386.00	125.00	386.00	2
11	125.00	386.00	125.10	388.00	2
12	125.10	388.00	148.00	388.00	2
13	148.00	388.00	148.10	391.00	2
14	148.10	391.00	160.00	391.00	2
15	160.00	391.00	160.10	394.00	2
16	160.10	394.00	190.00	394.00	2
17	190.00	394.00	190.10	396.00	2
18	190.10	396.00	220.00	397.00	2
19	63.00	366.00	86.00	366.00	2
20	86.00	366.00	104.00	379.00	2

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	130.0	200.0	20.0	0.00	0.0	0
2	125.0	135.0	250.0	31.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.632(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 15.00(ft)
and X = 30.00(ft)

Each Surface Terminates Between X = 135.00(ft)
and X = 150.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
4.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 2.738 FS Min = 1.886 FS Ave = 2.249
Standard Deviation = 0.258 Coefficient of Variation = 11.47 %
Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.00	354.00
2	33.98	353.62
3	37.97	353.34
4	41.97	353.16
5	45.97	353.09
6	49.97	353.12
7	53.96	353.26
8	57.96	353.50
9	61.94	353.84
10	65.92	354.29
11	69.88	354.84
12	73.83	355.49
13	77.75	356.24
14	81.66	357.10
15	85.55	358.06
16	89.40	359.11
17	93.23	360.27
18	97.03	361.53
19	100.79	362.88
20	104.52	364.34
21	108.21	365.88
22	111.86	367.53
23	115.46	369.26
24	119.02	371.10
25	122.52	373.02
26	125.98	375.03
27	129.38	377.13
28	132.73	379.32
29	136.02	381.60
30	139.25	383.96
31	142.42	386.40
32	144.38	388.00

Circle Center At X = 46.74 ; Y = 507.09 ; and Radius = 154.00
Factor of Safety
*** 1.886 ***
Individual data on the 42 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.0	54.1	0.0	0.0	0.	0.	8.1	0.0	0.0
2	0.1	34.9	0.0	0.0	0.	0.	5.2	0.0	0.0
3	0.9	588.5	0.0	0.0	0.	0.	88.3	0.0	0.0
4	2.0	1375.9	0.0	0.0	0.	0.	206.4	0.0	0.0
5	2.0	1544.9	0.0	0.0	0.	0.	231.7	0.0	0.0
6	4.0	4229.0	0.0	0.0	0.	0.	634.4	0.0	0.0
7	4.0	5661.7	0.0	0.0	0.	0.	849.3	0.0	0.0
8	4.0	7040.6	0.0	0.0	0.	0.	1056.1	0.0	0.0
9	4.0	8362.1	0.0	0.0	0.	0.	1254.3	0.0	0.0
10	1.0	2375.0	0.0	0.0	0.	0.	356.3	0.0	0.0
11	3.0	6463.3	0.0	0.0	0.	0.	969.5	0.0	0.0
12	4.0	7282.0	0.0	0.0	0.	0.	1092.3	0.0	0.0
13	1.1	1651.0	0.0	0.0	0.	0.	247.7	0.0	0.0
14	2.9	4376.4	0.0	0.0	0.	0.	656.5	0.0	0.0

15	4.0	5867.2	0.0	0.0	0.	0.	880.1	0.0	0.0
16	3.9	5710.6	0.0	0.0	0.	0.	856.6	0.0	0.0
17	3.9	5500.2	0.0	0.0	0.	0.	825.0	0.0	0.0
18	3.9	5237.4	0.0	0.0	0.	0.	785.6	0.0	0.0
19	3.9	4923.5	0.0	0.0	0.	0.	738.5	0.0	0.0
20	0.5	555.3	0.0	0.0	0.	0.	83.3	0.0	0.0
21	3.4	4390.2	0.0	0.0	0.	0.	658.5	0.0	0.0
22	3.8	5504.0	0.0	0.0	0.	0.	825.6	0.0	0.0
23	3.8	6000.1	0.0	0.0	0.	0.	900.0	0.0	0.0
24	3.8	6427.1	0.0	0.0	0.	0.	964.1	0.0	0.0
25	3.2	5813.9	0.0	0.0	0.	0.	872.1	0.0	0.0
26	0.1	216.8	0.0	0.0	0.	0.	32.5	0.0	0.0
27	0.4	1040.4	0.0	0.0	0.	0.	156.1	0.0	0.0
28	3.7	8919.9	0.0	0.0	0.	0.	1338.0	0.0	0.0
29	3.6	8430.0	0.0	0.0	0.	0.	1264.5	0.0	0.0
30	2.1	4755.0	0.0	0.0	0.	0.	713.2	0.0	0.0
31	1.5	3115.2	0.0	0.0	0.	0.	467.3	0.0	0.0
32	3.6	7033.1	0.0	0.0	0.	0.	1055.0	0.0	0.0
33	3.5	6114.0	0.0	0.0	0.	0.	917.1	0.0	0.0
34	2.5	3796.5	0.0	0.0	0.	0.	569.5	0.0	0.0
35	0.1	156.4	0.0	0.0	0.	0.	23.5	0.0	0.0
36	0.9	1454.4	0.0	0.0	0.	0.	218.2	0.0	0.0
37	3.4	5070.6	0.0	0.0	0.	0.	760.6	0.0	0.0
38	3.3	4089.8	0.0	0.0	0.	0.	613.5	0.0	0.0
39	3.3	3101.0	0.0	0.0	0.	0.	465.2	0.0	0.0
40	3.2	2108.6	0.0	0.0	0.	0.	316.3	0.0	0.0
41	3.2	1117.1	0.0	0.0	0.	0.	167.6	0.0	0.0
42	2.0	196.7	0.0	0.0	0.	0.	29.5	0.0	0.0

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.33	354.00
2	32.30	353.51
3	36.29	353.13
4	40.28	352.86
5	44.27	352.70
6	48.27	352.65
7	52.27	352.71
8	56.27	352.88
9	60.26	353.16
10	64.24	353.55
11	68.21	354.04
12	72.16	354.65
13	76.10	355.37
14	80.01	356.19
15	83.90	357.12
16	87.77	358.16
17	91.60	359.30
18	95.40	360.55
19	99.16	361.90
20	102.89	363.36
21	106.57	364.91
22	110.21	366.57
23	113.81	368.33
24	117.35	370.19
25	120.84	372.14
26	124.28	374.19
27	127.66	376.33
28	130.97	378.56
29	134.23	380.88
30	137.42	383.30
31	140.54	385.80
32	143.15	388.00

Circle Center At X = 48.12 ; Y = 498.05 ; and Radius = 145.40

Factor of Safety

*** 1.887 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.00	354.00

2	33.97	353.49
3	37.95	353.09
4	41.94	352.79
5	45.93	352.61
6	49.93	352.54
7	53.93	352.57
8	57.93	352.72
9	61.92	352.98
10	65.90	353.35
11	69.87	353.82
12	73.83	354.41
13	77.77	355.11
14	81.69	355.91
15	85.58	356.82
16	89.45	357.84
17	93.29	358.96
18	97.10	360.19
19	100.87	361.52
20	104.60	362.96
21	108.29	364.50
22	111.94	366.14
23	115.55	367.88
24	119.10	369.71
25	122.60	371.65
26	126.04	373.68
27	129.43	375.81
28	132.76	378.02
29	136.03	380.33
30	139.23	382.73
31	142.37	385.21
32	145.43	387.78
33	145.68	388.00

Circle Center At X = 50.57 ; Y = 497.81 ; and Radius = 145.27

Factor of Safety

*** 1.887 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.00	354.00
2	33.96	353.46
3	37.94	353.03
4	41.93	352.72
5	45.92	352.53
6	49.92	352.46
7	53.92	352.50
8	57.92	352.66
9	61.91	352.93
10	65.89	353.32
11	69.86	353.83
12	73.81	354.46
13	77.74	355.20
14	81.65	356.05
15	85.53	357.02
16	89.38	358.10
17	93.20	359.29
18	96.98	360.60
19	100.72	362.01
20	104.42	363.54
21	108.07	365.17
22	111.67	366.91
23	115.22	368.75
24	118.72	370.69
25	122.16	372.74
26	125.53	374.89
27	128.84	377.13
28	132.09	379.47
29	135.26	381.91
30	138.36	384.43
31	141.39	387.05
32	142.43	388.00

Circle Center At X = 50.50 ; Y = 489.08 ; and Radius = 136.63

Factor of Safety

*** 1.888 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.00	354.00
2	33.97	353.48
3	37.95	353.08
4	41.93	352.78
5	45.93	352.59
6	49.93	352.51
7	53.93	352.53
8	57.93	352.67
9	61.92	352.92
10	65.90	353.27
11	69.88	353.74
12	73.84	354.31
13	77.78	354.99
14	81.70	355.77
15	85.60	356.67
16	89.47	357.66
17	93.32	358.77
18	97.13	359.98
19	100.91	361.29
20	104.65	362.70
21	108.35	364.22
22	112.01	365.83
23	115.62	367.55
24	119.19	369.36
25	122.70	371.27
26	126.17	373.28
27	129.57	375.38
28	132.92	377.57
29	136.20	379.85
30	139.43	382.22
31	142.58	384.67
32	145.67	387.22
33	146.57	388.00

Circle Center At X = 50.90 ; Y = 499.23 ; and Radius = 146.73

Factor of Safety

*** 1.888 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.95	353.37
3	32.92	352.85
4	36.90	352.44
5	40.88	352.15
6	44.88	351.97
7	48.88	351.91
8	52.88	351.95
9	56.88	352.12
10	60.87	352.39
11	64.85	352.78
12	68.82	353.28
13	72.77	353.89
14	76.70	354.61
15	80.62	355.45
16	84.50	356.40
17	88.36	357.45
18	92.19	358.62
19	95.98	359.89
20	99.73	361.27
21	103.45	362.76
22	107.12	364.35
23	110.74	366.05
24	114.31	367.84
25	117.83	369.74

26	121.30	371.74
27	124.71	373.83
28	128.05	376.02
29	131.34	378.31
30	134.55	380.69
31	137.70	383.15
32	140.78	385.71
33	143.39	388.00

Circle Center At X = 49.20 ; Y = 492.86 ; and Radius = 140.95

Factor of Safety

*** 1.888 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.95	353.38
3	32.92	352.88
4	36.90	352.48
5	40.89	352.19
6	44.89	352.01
7	48.88	351.94
8	52.88	351.98
9	56.88	352.13
10	60.87	352.39
11	64.86	352.76
12	68.83	353.23
13	72.78	353.82
14	76.72	354.52
15	80.64	355.32
16	84.54	356.23
17	88.40	357.25
18	92.24	358.37
19	96.05	359.60
20	99.82	360.93
21	103.56	362.37
22	107.25	363.91
23	110.90	365.55
24	114.50	367.28
25	118.05	369.12
26	121.55	371.05
27	125.00	373.08
28	128.39	375.21
29	131.72	377.42
30	134.99	379.73
31	138.20	382.12
32	141.33	384.60
33	144.40	387.17
34	145.34	388.00

Circle Center At X = 49.43 ; Y = 497.48 ; and Radius = 145.55

Factor of Safety

*** 1.888 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.33	354.00
2	32.31	353.55
3	36.29	353.20
4	40.29	352.97
5	44.28	352.84
6	48.28	352.82
7	52.28	352.91
8	56.28	353.11
9	60.27	353.42
10	64.24	353.84
11	68.21	354.36
12	72.16	355.00
13	76.09	355.74
14	80.00	356.58
15	83.88	357.54
16	87.74	358.59

17	91.57	359.76
18	95.36	361.02
19	99.12	362.39
20	102.84	363.86
21	106.52	365.43
22	110.15	367.11
23	113.74	368.87
24	117.28	370.74
25	120.77	372.70
26	124.20	374.76
27	127.57	376.91
28	130.88	379.15
29	134.14	381.48
30	137.32	383.89
31	140.44	386.40
32	142.34	388.00

Circle Center At X = 46.95 ; Y = 499.71 ; and Radius = 146.90

Factor of Safety
*** 1.888 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.33	354.00
2	32.31	353.57
3	36.30	353.25
4	40.29	353.03
5	44.29	352.90
6	48.29	352.88
7	52.29	352.96
8	56.28	353.14
9	60.27	353.43
10	64.26	353.81
11	68.23	354.30
12	72.18	354.88
13	76.12	355.57
14	80.05	356.35
15	83.95	357.24
16	87.82	358.22
17	91.68	359.30
18	95.50	360.48
19	99.29	361.75
20	103.05	363.12
21	106.77	364.59
22	110.45	366.14
23	114.10	367.80
24	117.70	369.54
25	121.25	371.37
26	124.76	373.30
27	128.22	375.31
28	131.62	377.41
29	134.97	379.59
30	138.27	381.86
31	141.50	384.21
32	144.68	386.64
33	146.36	388.00

Circle Center At X = 47.12 ; Y = 510.70 ; and Radius = 157.82

Factor of Safety
*** 1.888 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.33	354.00
2	32.31	353.60
3	36.30	353.30
4	40.30	353.11
5	44.30	353.02
6	48.30	353.03
7	52.29	353.14
8	56.29	353.36
9	60.28	353.68

10	64.25	354.11
11	68.22	354.63
12	72.17	355.26
13	76.10	355.99
14	80.01	356.82
15	83.90	357.76
16	87.77	358.79
17	91.60	359.92
18	95.41	361.15
19	99.18	362.48
20	102.92	363.91
21	106.62	365.43
22	110.28	367.04
23	113.90	368.75
24	117.47	370.56
25	120.99	372.45
26	124.46	374.43
27	127.88	376.51
28	131.25	378.67
29	134.56	380.92
30	137.81	383.25
31	141.00	385.66
32	143.92	388.00

Circle Center At X = 45.83 ; Y = 507.98 ; and Radius = 154.97

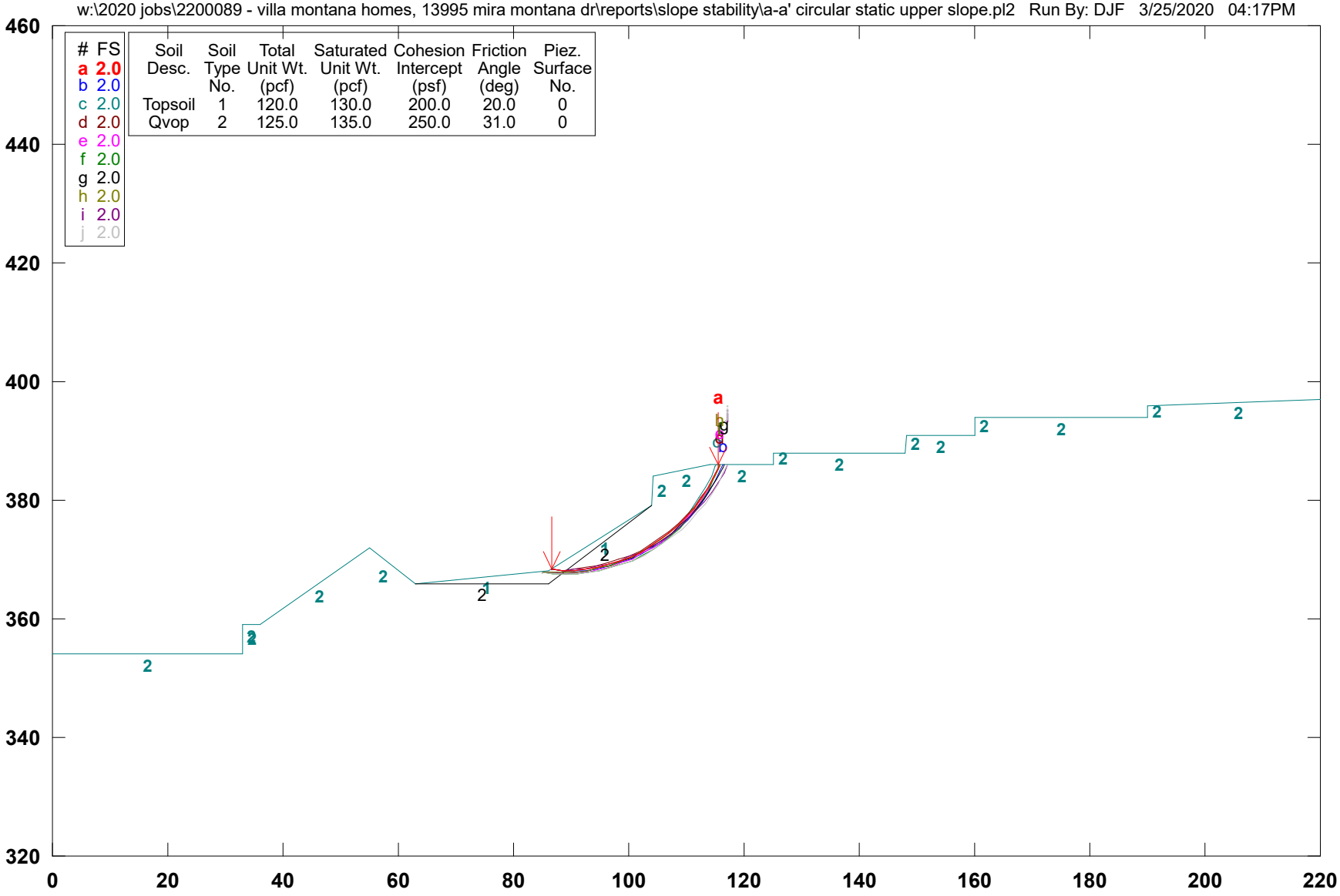
Factor of Safety

*** 1.888 ***

**** END OF GSTABL7 OUTPUT ****

Villa Montana Homes 2200089 A-A' Circular Upper Slope

w:\2020 jobs\2200089 - villa montana homes, 13995 mira montana dr\reports\slope stability\a-a' circular static upper slope.pl2 Run By: DJF 3/25/2020 04:17PM



#	FS
a	2.0
b	2.0
c	2.0
d	2.0
e	2.0
f	2.0
g	2.0
h	2.0
i	2.0
j	2.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Topsoil	1	120.0	130.0	200.0	20.0	0
Qvop	2	125.0	135.0	250.0	31.0	0

GSTABL7 v.2 FSmin=2.0

Safety Factors Are Calculated By The Modified Bishop Method

CHRISTIAN WHEELER ENGINEERING

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 3/25/2020
Time of Run: 04:17PM
Run By: DJF
Input Data Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular static upper slope.in
Output Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular static upper slope.OUT
Unit System: English
Plotted Output Filename: W:\2020 Jobs\2200089 - Villa Mon Homes, 13995 Mira Montana D
r\Reports\Slope Stability\a-a' circular static upper slope.PLT
PROBLEM DESCRIPTION: Villa Montana Homes
2200089 A-A' Circular Upper Slope

BOUNDARY COORDINATES
18 Top Boundaries
20 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	354.00	33.00	354.00	2
2	33.00	354.00	33.10	359.00	2
3	33.10	359.00	36.00	359.00	2
4	36.00	359.00	55.00	372.00	2
5	55.00	372.00	63.00	366.00	2
6	63.00	366.00	86.00	368.00	1
7	86.00	368.00	104.00	379.00	1
8	104.00	379.00	104.10	384.00	2
9	104.10	384.00	114.00	386.00	2
10	114.00	386.00	125.00	386.00	2
11	125.00	386.00	125.10	388.00	2
12	125.10	388.00	148.00	388.00	2
13	148.00	388.00	148.10	391.00	2
14	148.10	391.00	160.00	391.00	2
15	160.00	391.00	160.10	394.00	2
16	160.10	394.00	190.00	394.00	2
17	190.00	394.00	190.10	396.00	2
18	190.10	396.00	220.00	397.00	2
19	63.00	366.00	86.00	366.00	2
20	86.00	366.00	104.00	379.00	2

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	130.0	200.0	20.0	0.00	0.0	0
2	125.0	135.0	250.0	31.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 5 Points Equally Spaced
Along The Ground Surface Between X = 82.00(ft)
and X = 88.00(ft)
Each Surface Terminates Between X = 115.00(ft)
and X = 120.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)

2.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 1000
Statistical Data On All Valid FS Values:
FS Max = 3.268 FS Min = 1.983 FS Ave = 2.226
Standard Deviation = 0.190 Coefficient of Variation = 8.55 %
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.19
3	90.50	368.21
4	92.49	368.37
5	94.47	368.67
6	96.42	369.10
7	98.33	369.68
8	100.20	370.39
9	102.02	371.23
10	103.77	372.19
11	105.45	373.27
12	107.05	374.47
13	108.57	375.78
14	109.98	377.19
15	111.30	378.70
16	112.50	380.30
17	113.59	381.98
18	114.56	383.73
19	115.40	385.54
20	115.58	386.00

Circle Center At X = 89.22 ; Y = 396.58 ; and Radius = 28.40
Factor of Safety
*** 1.983 ***
Individual data on the 23 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	2.0	160.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.5	96.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	1.5	373.1	0.0	0.0	0.	0.	0.0	0.0	0.0
4	2.0	751.5	0.0	0.0	0.	0.	0.0	0.0	0.0
5	2.0	990.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	2.0	1182.2	0.0	0.0	0.	0.	0.0	0.0	0.0
7	1.9	1324.3	0.0	0.0	0.	0.	0.0	0.0	0.0
8	1.9	1415.6	0.0	0.0	0.	0.	0.0	0.0	0.0
9	1.8	1456.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.8	1449.1	0.0	0.0	0.	0.	0.0	0.0	0.0
11	0.2	188.9	0.0	0.0	0.	0.	0.0	0.0	0.0
12	0.1	114.2	0.0	0.0	0.	0.	0.0	0.0	0.0
13	1.4	1912.8	0.0	0.0	0.	0.	0.0	0.0	0.0
14	1.6	2113.0	0.0	0.0	0.	0.	0.0	0.0	0.0
15	1.5	1818.7	0.0	0.0	0.	0.	0.0	0.0	0.0
16	1.4	1515.0	0.0	0.0	0.	0.	0.0	0.0	0.0
17	1.3	1210.6	0.0	0.0	0.	0.	0.0	0.0	0.0
18	1.2	914.5	0.0	0.0	0.	0.	0.0	0.0	0.0
19	1.1	635.7	0.0	0.0	0.	0.	0.0	0.0	0.0
20	0.4	185.3	0.0	0.0	0.	0.	0.0	0.0	0.0
21	0.6	193.8	0.0	0.0	0.	0.	0.0	0.0	0.0
22	0.8	144.1	0.0	0.0	0.	0.	0.0	0.0	0.0
23	0.2	5.1	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.49	368.15
3	90.49	368.14
4	92.49	368.26

5	94.47	368.52
6	96.43	368.92
7	98.36	369.46
8	100.24	370.13
9	102.08	370.93
10	103.85	371.86
11	105.55	372.91
12	107.18	374.07
13	108.72	375.35
14	110.17	376.72
15	111.52	378.20
16	112.76	379.77
17	113.89	381.42
18	114.90	383.14
19	115.79	384.94
20	116.23	386.00

Circle Center At X = 89.72 ; Y = 396.71 ; and Radius = 28.59

Factor of Safety

*** 1.983 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.17
3	90.50	368.18
4	92.49	368.33
5	94.47	368.63
6	96.42	369.07
7	98.33	369.65
8	100.20	370.36
9	102.01	371.22
10	103.75	372.20
11	105.42	373.30
12	107.00	374.52
13	108.49	375.86
14	109.88	377.30
15	111.16	378.83
16	112.33	380.46
17	113.37	382.16
18	114.29	383.94
19	115.08	385.78
20	115.16	386.00

Circle Center At X = 89.39 ; Y = 395.68 ; and Radius = 27.53

Factor of Safety

*** 1.985 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.26
3	90.50	368.34
4	92.49	368.56
5	94.46	368.90
6	96.40	369.38
7	98.31	369.98
8	100.17	370.70
9	101.98	371.55
10	103.73	372.52
11	105.42	373.59
12	107.03	374.78
13	108.55	376.07
14	109.99	377.46
15	111.34	378.94
16	112.58	380.51
17	113.72	382.15
18	114.75	383.87
19	115.66	385.65
20	115.81	386.00

Circle Center At X = 88.24 ; Y = 398.55 ; and Radius = 30.29

Factor of Safety

*** 1.985 ***
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	86.99	367.71
3	88.99	367.65
4	90.99	367.73
5	92.98	367.94
6	94.94	368.30
7	96.88	368.78
8	98.79	369.40
9	100.64	370.16
10	102.44	371.03
11	104.17	372.03
12	105.83	373.15
13	107.40	374.38
14	108.89	375.72
15	110.28	377.15
16	111.57	378.68
17	112.75	380.30
18	113.82	381.99
19	114.76	383.75
20	115.58	385.58
21	115.74	386.00

Circle Center At X = 88.88 ; Y = 396.51 ; and Radius = 28.86

Factor of Safety
*** 1.985 ***
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	86.98	367.67
3	88.98	367.56
4	90.98	367.60
5	92.97	367.78
6	94.95	368.10
7	96.89	368.56
8	98.80	369.15
9	100.66	369.89
10	102.47	370.75
11	104.21	371.74
12	105.87	372.85
13	107.45	374.07
14	108.94	375.41
15	110.33	376.85
16	111.61	378.38
17	112.79	380.00
18	113.84	381.70
19	114.77	383.47
20	115.57	385.30
21	115.82	386.00

Circle Center At X = 89.47 ; Y = 395.63 ; and Radius = 28.08

Factor of Safety
*** 1.987 ***
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	87.00	367.79
3	89.00	367.80
4	90.99	367.93
5	92.98	368.19
6	94.94	368.57
7	96.87	369.08
8	98.77	369.71
9	100.63	370.46
10	102.43	371.32
11	104.18	372.30
12	105.86	373.38

13	107.46	374.57
14	108.99	375.86
15	110.44	377.24
16	111.79	378.71
17	113.05	380.27
18	114.21	381.90
19	115.26	383.60
20	116.21	385.36
21	116.49	386.00

Circle Center At X = 87.90 ; Y = 399.36 ; and Radius = 31.58

Factor of Safety
*** 1.987 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	87.00	367.78
3	89.00	367.78
4	90.99	367.91
5	92.97	368.17
6	94.94	368.56
7	96.87	369.08
8	98.76	369.73
9	100.60	370.50
10	102.39	371.39
11	104.12	372.40
12	105.78	373.52
13	107.36	374.74
14	108.86	376.07
15	110.26	377.50
16	111.57	379.01
17	112.77	380.61
18	113.87	382.28
19	114.86	384.02
20	115.72	385.82
21	115.79	386.00

Circle Center At X = 88.02 ; Y = 398.04 ; and Radius = 30.28

Factor of Safety
*** 1.988 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.25
3	90.50	368.31
4	92.49	368.50
5	94.46	368.81
6	96.42	369.25
7	98.34	369.81
8	100.22	370.48
9	102.06	371.27
10	103.84	372.18
11	105.57	373.19
12	107.22	374.31
13	108.81	375.53
14	110.32	376.84
15	111.74	378.25
16	113.07	379.74
17	114.30	381.31
18	115.44	382.96
19	116.47	384.68
20	117.16	386.00

Circle Center At X = 88.46 ; Y = 400.32 ; and Radius = 32.08

Factor of Safety
*** 1.988 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	86.99	367.70

3	88.99	367.62
4	90.99	367.67
5	92.98	367.85
6	94.95	368.16
7	96.90	368.60
8	98.82	369.17
9	100.70	369.87
10	102.52	370.68
11	104.29	371.62
12	105.99	372.67
13	107.62	373.83
14	109.17	375.09
15	110.64	376.45
16	112.01	377.91
17	113.28	379.45
18	114.44	381.08
19	115.50	382.78
20	116.44	384.54
21	117.11	386.00

Circle Center At X = 89.23 ; Y = 397.96 ; and Radius = 30.34

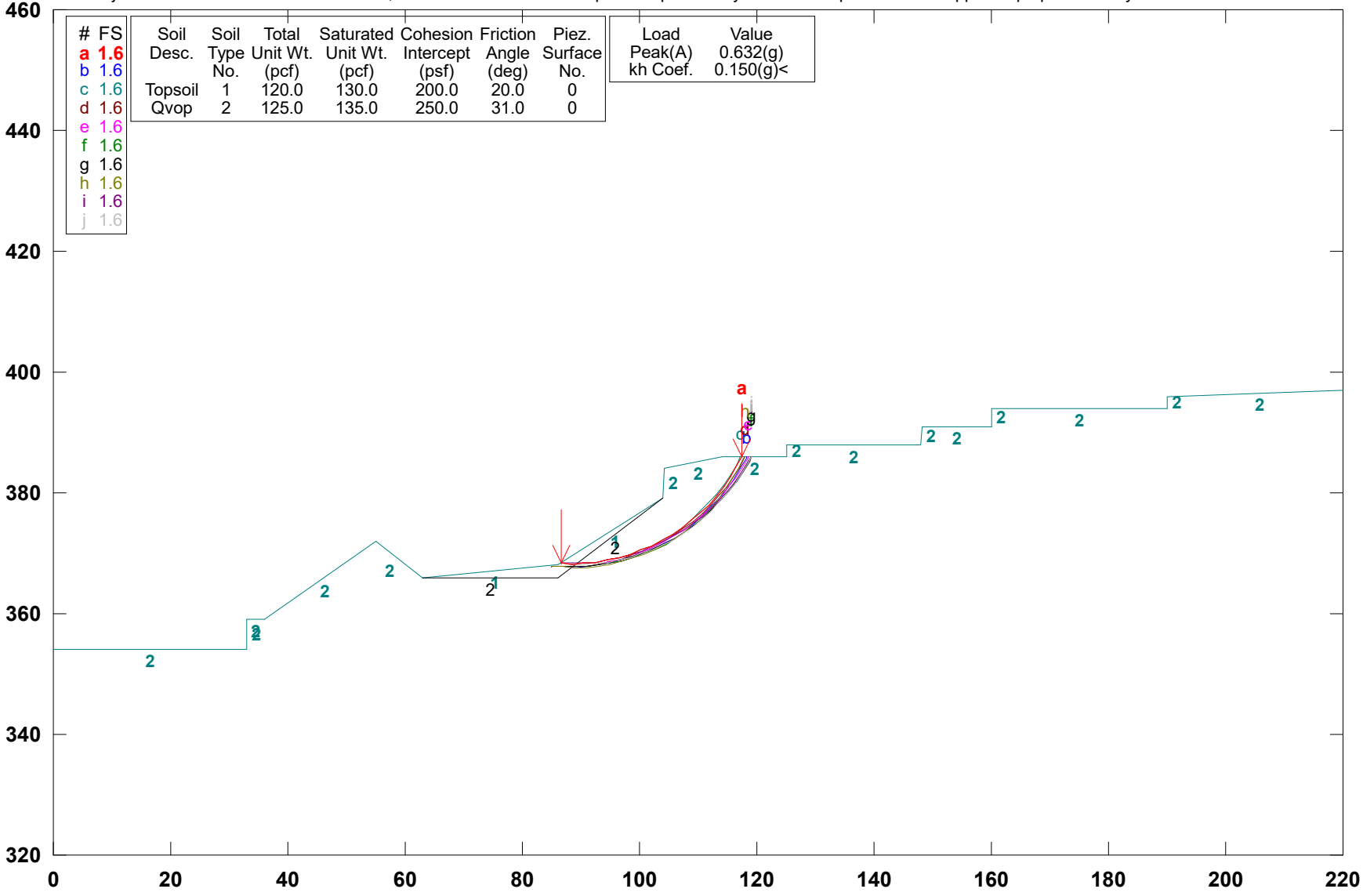
Factor of Safety

*** 1.988 ***

**** END OF GSTABL7 OUTPUT ****

Villa Montana Homes 2200089 A-A' Pseudo Static Upper Slope

w:\2020 jobs\2200089 - villa montana homes, 13995 mira montana dr\reports\slope stability\a-a' circular pseudo static upper slope.pl2 Run By: DJF 3/25/2020 05:13PM



#	FS
a	1.6
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.6
j	1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Topsoil	1	120.0	130.0	200.0	20.0	0
Qvop	2	125.0	135.0	250.0	31.0	0

Load	Value
Peak(A)	0.632(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Modified Bishop Method

CHRISTIAN WHEELER ENGINEERING

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 3/25/2020
Time of Run: 05:13PM
Run By: DJF
Input Data Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular pseudo static upper slope.in
Output Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\a-a' circular pseudo static upper slope.OUT
Unit System: English
Plotted Output Filename: W:\2020 Jobs\2200089 - Villa Mon Homes, 13995 Mira Montana D
r\Reports\Slope Stability\a-a' circular pseudo static upper slope.PLT
PROBLEM DESCRIPTION: Villa Montana Homes
2200089 A-A' Pseudo Static Upper Slope

BOUNDARY COORDINATES
18 Top Boundaries
20 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	354.00	33.00	354.00	2
2	33.00	354.00	33.10	359.00	2
3	33.10	359.00	36.00	359.00	2
4	36.00	359.00	55.00	372.00	2
5	55.00	372.00	63.00	366.00	2
6	63.00	366.00	86.00	368.00	1
7	86.00	368.00	104.00	379.00	1
8	104.00	379.00	104.10	384.00	2
9	104.10	384.00	114.00	386.00	2
10	114.00	386.00	125.00	386.00	2
11	125.00	386.00	125.10	388.00	2
12	125.10	388.00	148.00	388.00	2
13	148.00	388.00	148.10	391.00	2
14	148.10	391.00	160.00	391.00	2
15	160.00	391.00	160.10	394.00	2
16	160.10	394.00	190.00	394.00	2
17	190.00	394.00	190.10	396.00	2
18	190.10	396.00	220.00	397.00	2
19	63.00	366.00	86.00	366.00	2
20	86.00	366.00	104.00	379.00	2

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	130.0	200.0	20.0	0.00	0.0	0
2	125.0	135.0	250.0	31.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.632(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 5 Points Equally Spaced
Along The Ground Surface Between X = 82.00(ft)
and X = 88.00(ft)

Each Surface Terminates Between X = 115.00(ft)
and X = 120.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
2.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 1000
Statistical Data On All Valid FS Values:
FS Max = 2.590 FS Min = 1.560 FS Ave = 1.747
Standard Deviation = 0.150 Coefficient of Variation = 8.58 %
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.26
3	90.50	368.33
4	92.49	368.52
5	94.46	368.83
6	96.42	369.27
7	98.34	369.82
8	100.22	370.49
9	102.07	371.27
10	103.86	372.16
11	105.59	373.16
12	107.26	374.26
13	108.85	375.46
14	110.38	376.76
15	111.82	378.15
16	113.17	379.62
17	114.43	381.18
18	115.59	382.80
19	116.66	384.50
20	117.47	386.00

Circle Center At X = 88.33 ; Y = 401.05 ; and Radius = 32.80

Factor of Safety
*** 1.560 ***

Individual data on the 23 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	2.0	152.6	0.0	0.0	0.	0.	22.9	0.0	0.0
2	0.7	114.9	0.0	0.0	0.	0.	17.2	0.0	0.0
3	1.3	331.3	0.0	0.0	0.	0.	49.7	0.0	0.0
4	2.0	716.3	0.0	0.0	0.	0.	107.4	0.0	0.0
5	2.0	949.5	0.0	0.0	0.	0.	142.4	0.0	0.0
6	2.0	1142.4	0.0	0.0	0.	0.	171.4	0.0	0.0
7	1.9	1293.0	0.0	0.0	0.	0.	194.0	0.0	0.0
8	1.9	1400.5	0.0	0.0	0.	0.	210.1	0.0	0.0
9	1.8	1464.9	0.0	0.0	0.	0.	219.7	0.0	0.0
10	1.8	1487.1	0.0	0.0	0.	0.	223.1	0.0	0.0
11	0.1	122.3	0.0	0.0	0.	0.	18.3	0.0	0.0
12	0.1	115.3	0.0	0.0	0.	0.	17.3	0.0	0.0
13	1.5	2123.6	0.0	0.0	0.	0.	318.5	0.0	0.0
14	1.7	2243.6	0.0	0.0	0.	0.	336.5	0.0	0.0
15	1.6	1984.7	0.0	0.0	0.	0.	297.7	0.0	0.0
16	1.5	1712.2	0.0	0.0	0.	0.	256.8	0.0	0.0
17	1.4	1432.2	0.0	0.0	0.	0.	214.8	0.0	0.0
18	1.4	1151.3	0.0	0.0	0.	0.	172.7	0.0	0.0
19	0.8	600.8	0.0	0.0	0.	0.	90.1	0.0	0.0
20	0.4	272.9	0.0	0.0	0.	0.	40.9	0.0	0.0
21	1.2	583.3	0.0	0.0	0.	0.	87.5	0.0	0.0
22	1.1	312.1	0.0	0.0	0.	0.	46.8	0.0	0.0
23	0.8	76.9	0.0	0.0	0.	0.	11.5	0.0	0.0

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	85.00	367.91
2	86.99	367.75
3	88.99	367.71
4	90.99	367.79
5	92.98	367.99
6	94.96	368.31
7	96.91	368.75
8	98.83	369.30
9	100.71	369.98
10	102.55	370.76
11	104.34	371.65
12	106.08	372.65
13	107.75	373.75
14	109.35	374.95
15	110.87	376.24
16	112.32	377.63
17	113.67	379.09
18	114.94	380.64
19	116.11	382.26
20	117.18	383.95
21	118.15	385.70
22	118.29	386.00

Circle Center At X = 88.67 ; Y = 400.84 ; and Radius = 33.13

Factor of Safety

*** 1.560 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.25
3	90.50	368.31
4	92.49	368.50
5	94.46	368.81
6	96.42	369.25
7	98.34	369.81
8	100.22	370.48
9	102.06	371.27
10	103.84	372.18
11	105.57	373.19
12	107.22	374.31
13	108.81	375.53
14	110.32	376.84
15	111.74	378.25
16	113.07	379.74
17	114.30	381.31
18	115.44	382.96
19	116.47	384.68
20	117.16	386.00

Circle Center At X = 88.46 ; Y = 400.32 ; and Radius = 32.08

Factor of Safety

*** 1.560 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	87.00	367.81
3	89.00	367.83
4	90.99	367.96
5	92.98	368.21
6	94.94	368.57
7	96.89	369.05
8	98.80	369.64
9	100.67	370.34
10	102.50	371.15
11	104.28	372.07
12	106.00	373.08
13	107.66	374.20
14	109.25	375.41
15	110.77	376.71
16	112.21	378.10

17	113.56	379.57
18	114.83	381.12
19	116.00	382.74
20	117.08	384.43
21	117.96	386.00

Circle Center At X = 87.74 ; Y = 402.01 ; and Radius = 34.21

Factor of Safety
*** 1.561 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	87.00	367.82
3	89.00	367.83
4	90.99	367.96
5	92.98	368.21
6	94.95	368.56
7	96.89	369.02
8	98.81	369.60
9	100.69	370.28
10	102.53	371.06
11	104.32	371.95
12	106.06	372.94
13	107.74	374.02
14	109.36	375.20
15	110.90	376.47
16	112.38	377.82
17	113.77	379.25
18	115.09	380.76
19	116.31	382.34
20	117.44	383.99
21	118.48	385.70
22	118.64	386.00

Circle Center At X = 87.70 ; Y = 403.22 ; and Radius = 35.41

Factor of Safety
*** 1.561 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	86.99	367.76
3	88.99	367.73
4	90.99	367.81
5	92.98	368.01
6	94.96	368.32
7	96.91	368.75
8	98.84	369.28
9	100.73	369.93
10	102.58	370.69
11	104.39	371.55
12	106.14	372.52
13	107.83	373.58
14	109.46	374.75
15	111.02	376.00
16	112.50	377.34
17	113.90	378.77
18	115.22	380.27
19	116.45	381.85
20	117.59	383.49
21	118.62	385.20
22	119.05	386.00

Circle Center At X = 88.59 ; Y = 402.25 ; and Radius = 34.52

Factor of Safety
*** 1.561 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	87.00	367.79
3	89.00	367.78

4	90.99	367.88
5	92.98	368.09
6	94.96	368.42
7	96.91	368.86
8	98.83	369.40
9	100.72	370.05
10	102.57	370.81
11	104.38	371.67
12	106.13	372.64
13	107.83	373.70
14	109.46	374.85
15	111.03	376.09
16	112.52	377.42
17	113.94	378.83
18	115.27	380.32
19	116.52	381.89
20	117.68	383.52
21	118.75	385.21
22	119.18	386.00

Circle Center At X = 88.20 ; Y = 403.21 ; and Radius = 35.44

Factor of Safety

*** 1.561 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.00	367.91
2	86.99	367.71
3	88.99	367.64
4	90.99	367.69
5	92.98	367.87
6	94.96	368.17
7	96.91	368.60
8	98.83	369.15
9	100.72	369.82
10	102.56	370.61
11	104.34	371.51
12	106.07	372.52
13	107.72	373.64
14	109.31	374.87
15	110.81	376.18
16	112.23	377.60
17	113.55	379.09
18	114.78	380.67
19	115.91	382.32
20	116.93	384.04
21	117.84	385.83
22	117.91	386.00

Circle Center At X = 89.16 ; Y = 399.33 ; and Radius = 31.69

Factor of Safety

*** 1.561 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.27
3	90.50	368.35
4	92.49	368.53
5	94.47	368.83
6	96.43	369.23
7	98.36	369.74
8	100.26	370.36
9	102.13	371.09
10	103.95	371.91
11	105.72	372.84
12	107.44	373.86
13	109.10	374.98
14	110.69	376.18
15	112.22	377.48
16	113.67	378.85
17	115.05	380.31

18	116.34	381.83
19	117.54	383.43
20	118.65	385.09
21	119.19	386.00

Circle Center At X = 88.14 ; Y = 404.35 ; and Radius = 36.08

Factor of Safety

*** 1.561 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	86.50	368.31
2	88.50	368.18
3	90.50	368.18
4	92.49	368.30
5	94.48	368.53
6	96.45	368.88
7	98.39	369.35
8	100.30	369.94
9	102.18	370.64
10	104.01	371.45
11	105.78	372.37
12	107.50	373.39
13	109.16	374.51
14	110.74	375.73
15	112.25	377.05
16	113.68	378.45
17	115.02	379.93
18	116.27	381.49
19	117.42	383.12
20	118.48	384.82
21	119.12	386.00

Circle Center At X = 89.55 ; Y = 401.61 ; and Radius = 33.44

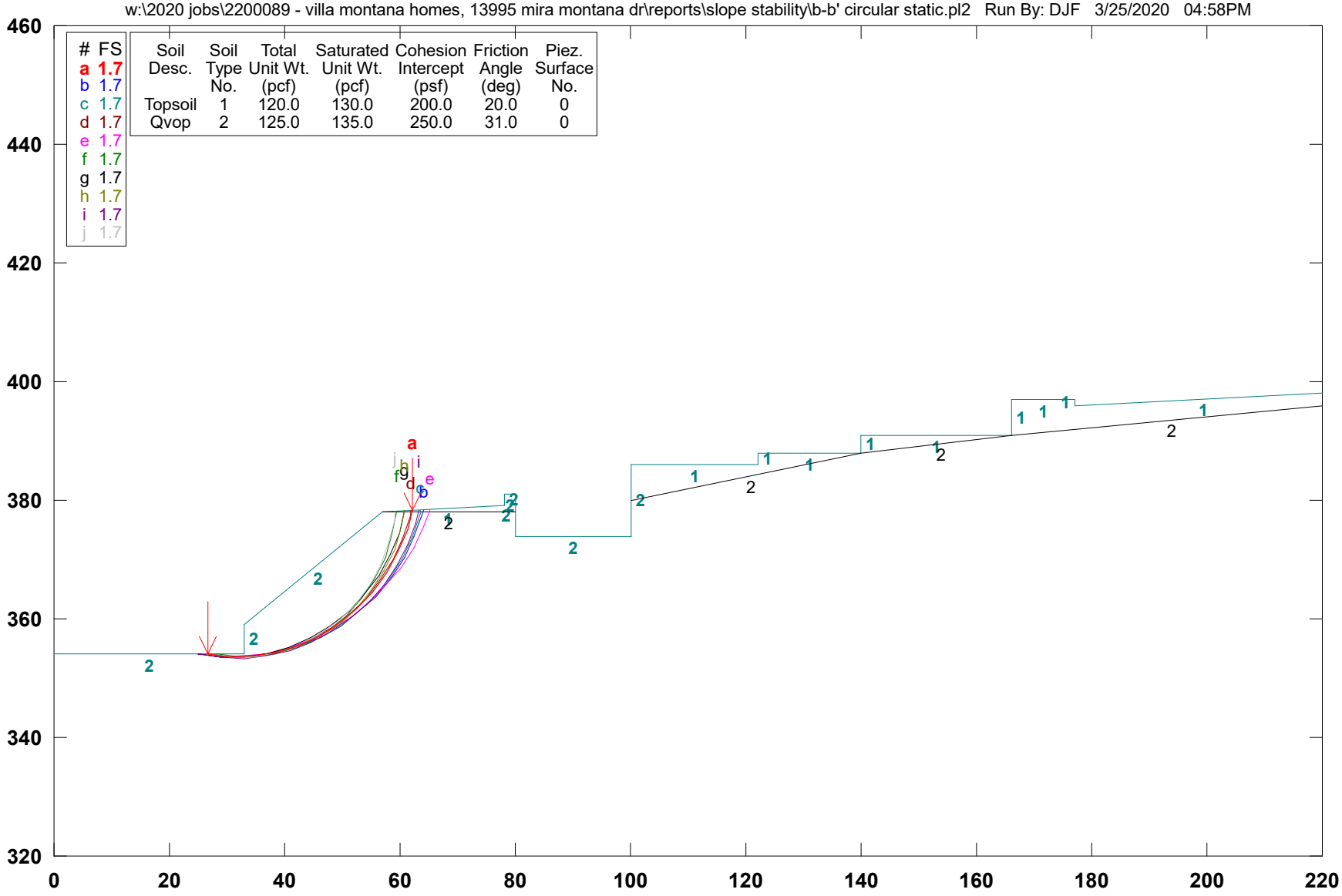
Factor of Safety

*** 1.562 ***

**** END OF GSTABL7 OUTPUT ****

Villa Montana Homes 2200089 B-B' Circular Static

w:\2020 jobs\2200089 - villa montana homes, 13995 mira montana dr\reports\slope stability\b-b' circular static.pl2 Run By: DJF 3/25/2020 04:58PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Topsoil	1	120.0	130.0	200.0	20.0	0
Qvop	2	125.0	135.0	250.0	31.0	0

GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

CHRISTIAN WHEELER ENGINEERING

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

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Analysis Run Date: 3/25/2020
Time of Run: 04:58PM
Run By: DJF
Input Data Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\b-b' circular static.in
Output Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\b-b' circular static.OUT
Unit System: English
Plotted Output Filename: W:\2020 Jobs\2200089 - Villa Mon Homes, 13995 Mira Montana D
r\Reports\Slope Stability\b-b' circular static.PLT
PROBLEM DESCRIPTION: Villa Montana Homes
2200089 B-B' Circular Static

BOUNDARY COORDINATES
18 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	354.00	33.00	354.00	2
2	33.00	354.00	33.10	359.00	2
3	33.10	359.00	57.00	378.00	2
4	57.00	378.00	78.00	379.00	1
5	78.00	379.00	78.10	381.00	2
6	78.10	381.00	80.00	381.00	2
7	80.00	381.00	80.10	374.00	2
8	80.10	374.00	100.00	374.00	2
9	100.00	374.00	100.10	386.00	2
10	100.10	386.00	122.00	386.00	1
11	122.00	386.00	122.10	388.00	1
12	122.10	388.00	140.00	388.00	1
13	140.00	388.00	140.10	391.00	1
14	140.10	391.00	166.00	391.00	1
15	166.00	391.00	166.10	397.00	1
16	166.10	397.00	177.00	397.00	1
17	177.00	397.00	177.10	396.00	1
18	177.10	396.00	220.00	398.00	1
19	57.00	378.00	80.00	378.00	2
20	100.00	380.00	140.00	388.00	2
21	140.00	388.00	166.00	391.00	2
22	166.00	391.00	220.00	396.00	2

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	130.0	200.0	20.0	0.00	0.0	0
2	125.0	135.0	250.0	31.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 15.00(ft)
and X = 30.00(ft)
Each Surface Terminates Between X = 55.00(ft)
and X = 75.00(ft)

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y =   0.00(ft)
 4.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max =   2.424   FS Min =   1.687   FS Ave =   2.085
Standard Deviation =   0.187   Coefficient of Variation =   8.99 %
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.65	353.62
3	34.65	353.76
4	38.59	354.41
5	42.43	355.56
6	46.08	357.18
7	49.49	359.27
8	52.62	361.77
9	55.39	364.65
10	57.77	367.86
11	59.73	371.35
12	61.22	375.06
13	62.04	378.24

Circle Center At X =   31.58 ; Y =   384.81 ; and Radius =   31.19
Factor of Safety
***   1.687   ***
Individual data on the   16 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.0	93.5	0.0	0.0	0.	0.	0.0	0.0	0.0
2	2.4	98.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.1	34.9	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.5	1136.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	3.9	3805.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	3.8	4746.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	3.7	5250.5	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.4	5315.5	0.0	0.0	0.	0.	0.0	0.0	0.0
9	3.1	4976.4	0.0	0.0	0.	0.	0.0	0.0	0.0
10	2.8	4304.2	0.0	0.0	0.	0.	0.0	0.0	0.0
11	1.6	2339.0	0.0	0.0	0.	0.	0.0	0.0	0.0
12	0.8	1033.2	0.0	0.0	0.	0.	0.0	0.0	0.0
13	2.0	2068.3	0.0	0.0	0.	0.	0.0	0.0	0.0
14	1.5	922.0	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.8	159.4	0.0	0.0	0.	0.	0.0	0.0	0.0
16	0.1	0.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.65	353.62
3	34.65	353.73
4	38.61	354.31
5	42.46	355.36
6	46.17	356.86
7	49.67	358.80
8	52.91	361.14
9	55.85	363.86
10	58.44	366.90
11	60.65	370.24
12	62.45	373.81
13	63.80	377.58
14	63.97	378.33

Circle Center At X =   31.81 ; Y =   386.88 ; and Radius =   33.28
Factor of Safety

*** 1.692 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.65	353.60
3	34.65	353.69
4	38.60	354.27
5	42.46	355.33
6	46.16	356.85
7	49.65	358.82
8	52.87	361.19
9	55.77	363.94
10	58.32	367.02
11	60.47	370.40
12	62.19	374.00
13	63.46	377.80
14	63.57	378.31

Circle Center At X = 31.91 ; Y = 386.20 ; and Radius = 32.63
Factor of Safety
*** 1.693 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.97	353.51
3	32.97	353.52
4	36.94	354.03
5	40.81	355.03
6	44.53	356.51
7	48.03	358.45
8	51.26	360.80
9	54.17	363.54
10	56.72	366.63
11	58.86	370.01
12	60.56	373.63
13	61.80	377.43
14	61.95	378.24

Circle Center At X = 30.90 ; Y = 385.29 ; and Radius = 31.84
Factor of Safety
*** 1.700 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.98	353.63
3	32.98	353.70
4	36.95	354.20
5	40.84	355.12
6	44.61	356.46
7	48.21	358.20
8	51.60	360.32
9	54.75	362.80
10	57.60	365.60
11	60.14	368.69
12	62.32	372.04
13	64.13	375.61
14	65.18	378.39

Circle Center At X = 30.39 ; Y = 390.41 ; and Radius = 36.81
Factor of Safety
*** 1.701 ***
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.33	354.00
2	32.32	353.64
3	36.31	353.87
4	40.22	354.71
5	43.97	356.12
6	47.46	358.07

7	50.62	360.52
8	53.37	363.42
9	55.66	366.70
10	57.44	370.29
11	58.66	374.10
12	59.29	378.05
13	59.29	378.11

Circle Center At X = 32.73 ; Y = 380.28 ; and Radius = 26.65

Factor of Safety

*** 1.701 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.98	353.55
3	32.97	353.62
4	36.93	354.20
5	40.78	355.29
6	44.46	356.86
7	47.91	358.88
8	51.07	361.34
9	53.89	364.18
10	56.32	367.35
11	58.32	370.81
12	59.87	374.51
13	60.87	378.18

Circle Center At X = 30.44 ; Y = 384.64 ; and Radius = 31.12

Factor of Safety

*** 1.701 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.64	353.51
3	34.64	353.57
4	38.59	354.19
5	42.42	355.34
6	46.05	357.02
7	49.42	359.18
8	52.45	361.79
9	55.10	364.79
10	57.30	368.12
11	59.02	371.74
12	60.23	375.55
13	60.67	378.17

Circle Center At X = 32.18 ; Y = 382.32 ; and Radius = 28.85

Factor of Safety

*** 1.704 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.96	353.43
3	32.96	353.35
4	36.94	353.76
5	40.84	354.65
6	44.60	356.01
7	48.17	357.81
8	51.49	360.04
9	54.52	362.66
10	57.20	365.62
11	59.51	368.89
12	61.39	372.42
13	62.84	376.15
14	63.38	378.30

Circle Center At X = 31.63 ; Y = 385.98 ; and Radius = 32.66

Factor of Safety

*** 1.709 ***

Failure Surface Specified By 13 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	26.67	354.00
2	30.64	353.53
3	34.64	353.64
4	38.58	354.33
5	42.37	355.59
6	45.95	357.38
7	49.23	359.68
8	52.14	362.42
9	54.62	365.56
10	56.61	369.03
11	58.09	372.75
12	59.01	376.64
13	59.13	378.10

Circle Center At X = 31.87 ; Y = 380.99 ; and Radius = 27.48

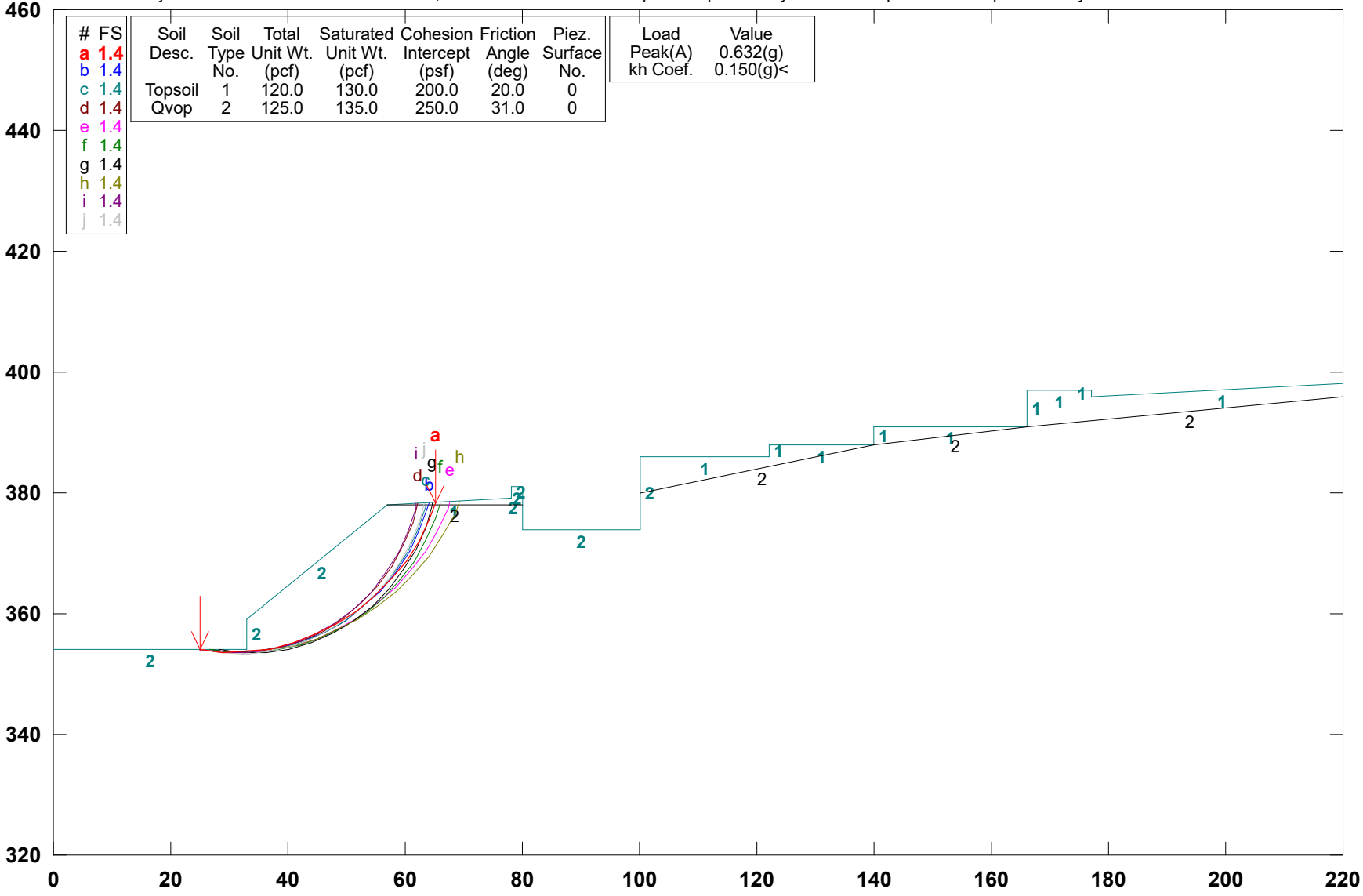
Factor of Safety

*** 1.713 ***

**** END OF GSTABL7 OUTPUT ****

Villa Montana Homes 2200089 B-B' Circular Pseudo Static

w:\2020 jobs\2200089 - villa montana homes, 13995 mira montana dr\reports\slope stability\b-b' circular pseudo static.pl2 Run By: DJF 3/25/2020 05:03PM



GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Modified Bishop Method

CHRISTIAN WHEELER ENGINEERING

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 3/25/2020
Time of Run: 05:03PM
Run By: DJF
Input Data Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\b-b' circular pseudo static.in
Output Filename: W:\2020 Jobs\2200089 - Villa Montana Homes, 13995 Mira Monta
na Dr\Reports\Slope Stability\b-b' circular pseudo static.OUT
Unit System: English
Plotted Output Filename: W:\2020 Jobs\2200089 - Villa Mon Homes, 13995 Mira Montana D
r\Reports\Slope Stability\b-b' circular pseudo static.PLT
PROBLEM DESCRIPTION: Villa Montana Homes
2200089 B-B' Circular Pseudo Static

BOUNDARY COORDINATES
18 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	354.00	33.00	354.00	2
2	33.00	354.00	33.10	359.00	2
3	33.10	359.00	57.00	378.00	2
4	57.00	378.00	78.00	379.00	1
5	78.00	379.00	78.10	381.00	2
6	78.10	381.00	80.00	381.00	2
7	80.00	381.00	80.10	374.00	2
8	80.10	374.00	100.00	374.00	2
9	100.00	374.00	100.10	386.00	2
10	100.10	386.00	122.00	386.00	1
11	122.00	386.00	122.10	388.00	1
12	122.10	388.00	140.00	388.00	1
13	140.00	388.00	140.10	391.00	1
14	140.10	391.00	166.00	391.00	1
15	166.00	391.00	166.10	397.00	1
16	166.10	397.00	177.00	397.00	1
17	177.00	397.00	177.10	396.00	1
18	177.10	396.00	220.00	398.00	1
19	57.00	378.00	80.00	378.00	2
20	100.00	380.00	140.00	388.00	2
21	140.00	388.00	166.00	391.00	2
22	166.00	391.00	220.00	396.00	2

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	130.0	200.0	20.0	0.00	0.0	0
2	125.0	135.0	250.0	31.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.632(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 10 Points Equally Spaced

Along The Ground Surface Between X = 15.00(ft)
and X = 30.00(ft)
Each Surface Terminates Between X = 55.00(ft)
and X = 75.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
4.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 1.879 FS Min = 1.356 FS Ave = 1.636
Standard Deviation = 0.141 Coefficient of Variation = 8.60 %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.98	353.63
3	32.98	353.70
4	36.95	354.20
5	40.84	355.12
6	44.61	356.46
7	48.21	358.20
8	51.60	360.32
9	54.75	362.80
10	57.60	365.60
11	60.14	368.69
12	62.32	372.04
13	64.13	375.61
14	65.18	378.39

Circle Center At X = 30.39 ; Y = 390.41 ; and Radius = 36.81
Factor of Safety
*** 1.356 ***
Individual data on the 17 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Ver (lbs)	Surcharge Load (lbs)
1	4.0	91.5	0.0	0.0	0.	0.	13.7	0.0	0.0
2	4.0	167.2	0.0	0.0	0.	0.	25.1	0.0	0.0
3	0.0	0.7	0.0	0.0	0.	0.	0.1	0.0	0.0
4	0.1	34.9	0.0	0.0	0.	0.	5.2	0.0	0.0
5	3.9	3165.8	0.0	0.0	0.	0.	474.9	0.0	0.0
6	3.9	4353.2	0.0	0.0	0.	0.	653.0	0.0	0.0
7	3.8	5116.2	0.0	0.0	0.	0.	767.4	0.0	0.0
8	3.6	5514.0	0.0	0.0	0.	0.	827.1	0.0	0.0
9	3.4	5552.7	0.0	0.0	0.	0.	832.9	0.0	0.0
10	3.1	5261.6	0.0	0.0	0.	0.	789.2	0.0	0.0
11	2.3	3718.4	0.0	0.0	0.	0.	557.8	0.0	0.0
12	0.6	955.9	0.0	0.0	0.	0.	143.4	0.0	0.0
13	2.5	3466.6	0.0	0.0	0.	0.	520.0	0.0	0.0
14	2.2	2137.6	0.0	0.0	0.	0.	320.6	0.0	0.0
15	1.8	1008.4	0.0	0.0	0.	0.	151.3	0.0	0.0
16	0.9	173.8	0.0	0.0	0.	0.	26.1	0.0	0.0
17	0.1	3.4	0.0	0.0	0.	0.	0.5	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.65	353.62
3	34.65	353.73
4	38.61	354.31
5	42.46	355.36
6	46.17	356.86
7	49.67	358.80
8	52.91	361.14
9	55.85	363.86
10	58.44	366.90

11	60.65	370.24
12	62.45	373.81
13	63.80	377.58
14	63.97	378.33

Circle Center At X = 31.81 ; Y = 386.88 ; and Radius = 33.28

Factor of Safety
*** 1.356 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.65	353.60
3	34.65	353.69
4	38.60	354.27
5	42.46	355.33
6	46.16	356.85
7	49.65	358.82
8	52.87	361.19
9	55.77	363.94
10	58.32	367.02
11	60.47	370.40
12	62.19	374.00
13	63.46	377.80
14	63.57	378.31

Circle Center At X = 31.91 ; Y = 386.20 ; and Radius = 32.63

Factor of Safety
*** 1.359 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.67	354.00
2	30.65	353.62
3	34.65	353.76
4	38.59	354.41
5	42.43	355.56
6	46.08	357.18
7	49.49	359.27
8	52.62	361.77
9	55.39	364.65
10	57.77	367.86
11	59.73	371.35
12	61.22	375.06
13	62.04	378.24

Circle Center At X = 31.58 ; Y = 384.81 ; and Radius = 31.19

Factor of Safety
*** 1.361 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.98	353.56
3	32.98	353.53
4	36.96	353.92
5	40.88	354.70
6	44.70	355.88
7	48.38	357.45
8	51.88	359.39
9	55.17	361.67
10	58.20	364.27
11	60.95	367.18
12	63.39	370.35
13	65.50	373.75
14	67.24	377.35
15	67.67	378.51

Circle Center At X = 31.25 ; Y = 392.58 ; and Radius = 39.08

Factor of Safety
*** 1.367 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	26.67	354.00
2	30.64	353.54
3	34.64	353.53
4	38.61	353.99
5	42.51	354.89
6	46.28	356.23
7	49.87	358.00
8	53.23	360.16
9	56.33	362.70
10	59.11	365.57
11	61.55	368.74
12	63.61	372.16
13	65.27	375.81
14	66.12	378.43

Circle Center At X = 32.70 ; Y = 388.33 ; and Radius = 34.85

Factor of Safety

*** 1.369 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.33	354.00
2	32.31	353.57
3	36.31	353.64
4	40.27	354.22
5	44.12	355.29
6	47.81	356.83
7	51.27	358.84
8	54.46	361.26
9	57.31	364.06
10	59.78	367.21
11	61.84	370.64
12	63.45	374.30
13	64.58	378.13
14	64.62	378.36

Circle Center At X = 33.75 ; Y = 385.15 ; and Radius = 31.61

Factor of Safety

*** 1.371 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.98	353.62
3	32.98	353.62
4	36.96	353.99
5	40.89	354.75
6	44.73	355.87
7	48.45	357.36
8	52.00	359.18
9	55.37	361.34
10	58.52	363.81
11	61.42	366.57
12	64.04	369.58
13	66.37	372.84
14	68.38	376.30
15	69.43	378.59

Circle Center At X = 31.00 ; Y = 395.67 ; and Radius = 42.10

Factor of Safety

*** 1.372 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.97	353.51
3	32.97	353.52
4	36.94	354.03
5	40.81	355.03
6	44.53	356.51
7	48.03	358.45
8	51.26	360.80
9	54.17	363.54

10	56.72	366.63
11	58.86	370.01
12	60.56	373.63
13	61.80	377.43
14	61.95	378.24

Circle Center At X = 30.90 ; Y = 385.29 ; and Radius = 31.84

Factor of Safety

*** 1.373 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.00	354.00
2	28.96	353.43
3	32.96	353.35
4	36.94	353.76
5	40.84	354.65
6	44.60	356.01
7	48.17	357.81
8	51.49	360.04
9	54.52	362.66
10	57.20	365.62
11	59.51	368.89
12	61.39	372.42
13	62.84	376.15
14	63.38	378.30

Circle Center At X = 31.63 ; Y = 385.98 ; and Radius = 32.66

Factor of Safety

*** 1.374 ***

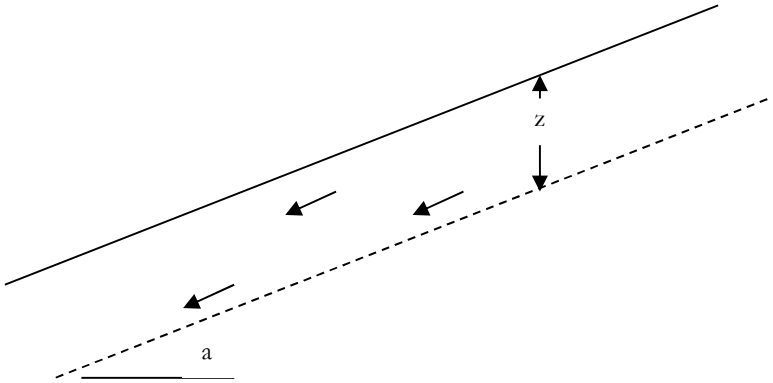
**** END OF GSTABL7 OUTPUT ****

APPENDIX F

Surficial Slope Stability

SURFICIAL SLOPE STABILITY

1.5:1 CUT SLOPE



SEEPAGE PARALLEL TO SLOPE

ASSUMED PARAMETERS

z	Depth of Saturation (ft)	4
a	Slope Angle (H:1)	1.5
γ_W	Unit Weight of Water (pcf)	62.4
γ_T	Saturated Unit Weight of Soil (pcf)	135
ϕ	Angle of Internal Friction Along Plane of Failure (degrees)	31
c	Cohesion Along Plane of Failure (psf)	250

FACTOR OF SAFETY

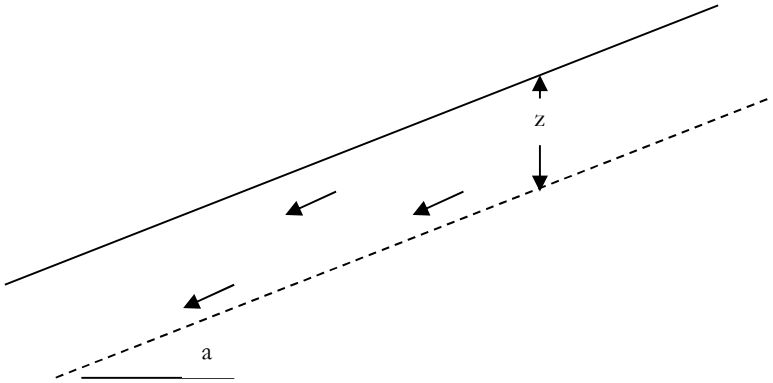
$$FS = \frac{c + T\,(\tan\phi)}{T} \longrightarrow FS = \frac{c + (\gamma_T - \gamma_W)(z)(\cos a)^2(\tan\phi)}{(\gamma_T)(z)(\sin a)(\cos a)}$$

FS = 1.5

Reference: Skempton, A., and Delory, F., 1957, "Stability of Natural Slopes in London Clay," Proceedings 4th International Conference on Soil Mechanics and Foundation Engineering, London, England, Butterworths, Vol. 2.

SURFICIAL SLOPE STABILITY

INLAND BLUFF



SEEPAGE PARALLEL TO SLOPE

ASSUMED PARAMETERS

z	Depth of Saturation (ft)	4
a	Slope Angle (H:1)	0.75
γ_W	Unit Weight of Water (pcf)	62.4
γ_T	Saturated Unit Weight of Soil (pcf)	135
ϕ	Angle of Internal Friction Along Plane of Failure (degrees)	31
c	Cohesion Along Plane of Failure (psf)	250

FACTOR OF SAFETY

$$FS = \frac{c + T\,(\tan\phi)}{T} \longrightarrow FS = \frac{c + (\gamma_T - \gamma_W)(z)(\cos a)^2(\tan\phi)}{(\gamma_T)(z)(\sin a)(\cos a)}$$

FS = 1.2

Reference: Skempton, A., and Delory, F., 1957, "Stability of Natural Slopes in London Clay," Proceedings 4th International Conference on Soil Mechanics and Foundation Engineering, London, England, Butterworths, Vol. 2.

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JOB NO.:	2200089.02	APPENDIX F-2	