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ENVIRONMENTAL & GEOTECHNICAL ENGINEERING NETWORK

GEOTECHNICAL FEASIBILITY STUDY

Cornerstone Community Church – Parking Lot and Ball Fields
Assessor's Parcel Numbers: 367-210-018 and 367-140-008
Monte Vista Drive and Baxter Road
City of Wildomar, County of Riverside, California
Project Number: T3477-GFS

March 8, 2006

Prepared for:

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EnGEN Corporation

• Soil Engineering and Consulting Services • Engineering Geology • Compaction Testing
• Inspections • Construction Materials Testing • Laboratory Testing • Percolation Testing
• Geology • Water Resource Studies • Phase I & II Environmental Site Assessments

ENVIRONMENTAL & GEOTECHNICAL ENGINEERING NETWORK

March 8, 2006

Ms. Julie White
Markham Development Management Group
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Regarding: **GEOTECHNICAL FEASIBILITY STUDY**
Cornerstone Community Church – Parking Lot and Ball Fields
Assessor's Parcel Numbers: 367-210-018 and 367-140-008
Monte Vista Drive and Baxter Road
Temecula Area, County of Riverside, California
Project Number: T3477-GFS

Reference:

1. **Markham Development Management Group, Inc.,** *Rough Grading and Erosion Control Plans*, P.U.P. No. 778, sheets 2 through 4, plans dated January 4, 2006.

2. **Gunvant Thakkar, P.E.,** *Grading Plan,* P.U.P. No. 778 R2, plan revised November 20, 2002.

Dear Ms. White:

In accordance with your request and signed authorization, a representative of this firm has visited the subject site on January 16, 2006, to visually observe the surficial conditions of the subject lot and to collect samples of representative surficial site materials. Laboratory testing was performed on these samples. Test results and recommendations for the construction and grading of the proposed development are provided. It is our understanding that cut and fill type grading will take place for the proposed development. Based on this firm's experience with this type of project, our understanding of the regional geologic conditions surrounding the site, our review of in-house maps, and both published and unpublished reports, subsurface exploration was not considered necessary. However, in lieu of subsurface exploration, additional grading beyond that anticipated in this report may be necessary depending on the exposed conditions to be encountered during grading. If any changes are made to the Referenced No. 1 Plans, they should be reviewed by this office so additional recommendations, if necessary, can be prepared.

The proposed grading will require cutting up to approximately 68 feet below ground surface. The cuts will be made into granodiorite bedrock. It is anticipated that the bedrock may be very hard, and special techniques, such as blasting, may be required in order to achieve the proposed cuts. A rippability survey was not within the scope of work. However, cuts of up to approximately 50 feet were made as a part of the grading operations for the existing parking lot, and reportedly only normal heavy grading equipment was utilized to achieve those cuts. Oversized rock may be generated during the cutting process, which should not be utilized in the fill. Oversized material is defined in Section 4.2 of this report.

1.0 SITE/PROJECT DESCRIPTION

1.1 **Site Description:** The subject site consists of a portion of approximately 48.43 acres on the east side of the existing Cornerstone Church, located on the northeast side of Monte Vista Drive between Baxter Road and Bundy Canyon Road in the Wildomar area of Riverside County, California. The site is currently developed with a paved parking lot which measures approximately 250 by 350 feet, existing 2:1 cut slopes surround the parking lot on its northern and eastern sides. The remainder of the site is in a natural condition and consists of steeply sloping hills, which slope at gradients of up to approximately 50 percent, and drain through several southwest-draining channels. No structures, other than the paving and drainage devices associated with the parking lot, exist on site. Vegetation on the hillsides consists of a dense cover of brush and weeds.

1.2 **Project Description:** It is our understanding that the proposed development will consist of the creation of several large playing fields and an additional parking lot with surrounding landscape and hardscape improvements. No structures are proposed. The majority of the material generated during the proposed grading will be exported off site. The above project description and assumptions were used as the basis for the field and laboratory exploration and testing programs and the engineering analysis for the conclusions and recommendations presented in this report. This office should be notified if structures, foundation loads, grading, and/or other details different from those presented herein are proposed for final development of the site so a review can be performed, supplemental evaluation made, and revised recommendations provided, if necessary. We are providing general grading recommendations for the proposed development.

2.0 FINDINGS

2.1 **Site Review:** Based on our field reconnaissance, it appears that alluvium and granodiorite bedrock underlie the site. A thin cover of slopewash, estimated to be up to approximately 1 to 2 feet thick mantles the bedrock. The alluvium is located in the southwest-trending drainages and is estimated to be on the order of 3 to 5-feet thick in the smaller drainages and on the order of 5 to 10-feet thick in the larger drainages. Since no subsurface exploration was performed for this study, the thickness and condition of the alluvium and slopewash is unknown.

2.2 **Laboratory Testing:**

2.2.1 **General:** The results of laboratory tests performed on samples of earth material obtained during the site visit are presented in the Appendix. Following is a listing and brief explanation of the laboratory tests performed. The samples obtained during the field study will be discarded 30 days after the date of this report. This office should be notified immediately if retention of samples will be needed beyond 30 days.

2.2.2 **Classification:** The field classification of soil materials encountered during our site visit were verified in the laboratory in general accordance with the Unified Soils Classification System, ASTM D 2488-00, Standard Practice for Determination and Identification of Soils (Visual-Manual Procedures).

2.2.3 **Maximum Dry Density/Optimum Moisture Content Relationship Test:** Maximum dry density/optimum moisture content relationship determinations were performed on samples of near-surface earth material in general accordance with ASTM 1557-02 procedures using a 4.0-inch diameter mold. Samples were prepared at various moisture contents and compacted in five (5) layers using a 10-pound weight dropping 18-inches and with 25 blows per layer. A plot of the compacted dry density versus the moisture content of the specimens is constructed and the maximum dry density and optimum moisture content determined from the plot.

2.2.4 **Expansion Potential:** Laboratory expansion tests were performed on samples of near-surface earth materials in general accordance with CBC 18-2 procedures. In this testing procedure, a remolded sample is compacted in two (2) layers in a 4.0-inch diameter mold to a total compacted thickness of approximately 1.0-inch by using a 5.5 pound weight

dropping 12-inches and with 15 blows per layer. The sample should be compacted at a saturation of between 49 and 51 percent. After remolding, the sample is confined under a pressure of 144 pounds per square foot (psf) and allowed to soak for 24 hours. The resulting volume change due to the increase in moisture content within the sample is recorded and the Expansion Index (EI) is calculated.

2.2.5 **Direct Shear Test (Remolded):** Direct shear tests were performed on select samples of near-surface earth material, which had been remolded to 90 percent of the maximum density, in general accordance with ASTM D 3080-03 procedures. The shear machine is of the constant strain type. The shear machine is designed to receive a 1.0-inch high, 2.416-inch diameter ring sample. Specimens from the sample were sheared at various pressures normal to the face of the specimens. The specimens were tested in a submerged condition. The maximum shear stresses were plotted versus the normal confining stresses to determine the shear strength (cohesion and angle of internal friction).

2.2.6 **Soluble Sulfates:** Samples of near-surface earth material were obtained for soluble sulfate testing for the site. The concentration of soluble sulfates was determined in general conformance with California Test Method 417 procedures.

2.3 **Excavation Characteristics:** Excavation and trenching within the alluvium and slopewash is anticipated to be relatively easy. Excavation and trenching in the bedrock will be more difficult due to the higher bedrock densities typically encountered in the area. A rippability survey was not within the scope of our investigation. However, cuts of up to approximately 50 feet were made as a part of the grading operations for the existing parking lot, and reportedly only normal heavy grading equipment was utilized to achieve those cuts. Blasting may be necessary in order to achieve the proposed cuts of up to 68-feet. Oversized rock may be generated during the cutting process.

3.0 ENGINEERING GEOLOGY/SEISMICITY

3.1 **Geologic Setting:** The site is located in the Northern Peninsular Range on the southern sector of the structural unit known as the Perris Block. The Perris Block is bounded on the northeast by the San Jacinto Fault Zone, on the southwest by the Elsinore Fault Zone, and on the north by the Cucamonga Fault Zone. The southern boundary of the Perris Block is not as distinct, but is believed to coincide with a complex group of faults trending southeast from the Murrieta, California area (Kennedy, 1977). The Peninsular Range is

characterized by large Mesozoic age intrusive rock masses flanked by volcanic, metasedimentary, and sedimentary rocks. Various thicknesses of alluvial and colluvial sediments derived from the erosion of the elevated portions of the region fill the low-lying areas. The earth materials encountered on the subject site are described in more detail in subsequent sections of this report.

3.2 **Seismic Hazards:** Because the proposed development is located in tectonically active southern California, it will likely experience some effects from earthquakes. The type or severity of seismic hazards affecting the site is mainly dependent upon the distance to the causative fault, the intensity of the seismic event, and the soil characteristics. The seismic hazard may be primary, such as ground surface rupture and/or ground shaking, or secondary, such as liquefaction or dynamic settlement.

3.2.1 **Surface Fault Rupture:** The site is not located within a State of California designated Alquist-Priolo Earthquake Fault Zone. No faulting was observed during our site reconnaissance. The nearest State designated active fault is the Elsinore Fault (Temecula Segment), located approximately 3.6-kilometers (2.2-miles) to the southwest of the subject site. This conclusion is based on literature review (references) and EnGEN Corporation's field reconnaissance. Accordingly, the potential for fault surface rupture on the site is very unlikely.

3.2.2 **Liquefaction:** Based on Section 4.0, Earthwork Recommendations, of this report, and the dense nature of the underlying bedrock, the potential for liquefaction at the site is considered very low.

3.2.3 **Seismically Induced Landsliding:** Due to the overall massive and dense nature of the bedrock, the probability of seismically induced landsliding is considered very low.

3.2.4 **Seismically Induced Flooding, Seiches and Tsunamis:** Due to the absence of a confined body of water in the immediate vicinity of the project site, the possibility of seismically induced flooding or seiches is considered nil. Due to the large distance of the project site to the Pacific Ocean, the possibility for seismically induced tsunamis to impact the site is considered nil.

3.3 Earth Materials

3.3.1 **Alluvium (Qal)**: The alluvium was observed in the southwest-trending drainages and is estimated to be on the order of 3 to 5 feet thick in the smaller drainages and on the order of 5 to 10 feet thick in the larger drainages. Since no subsurface investigation was performed as a part of this study, the thickness and condition of the alluvium are unknown.

3.3.2 **Granodiorite (Kgd):** Granodiorite constitutes bedrock at the subject site. The bedrock is covered by a thin mantle of slopewash (not shown on Plate 1), estimated to be on the order of 1 to 2 feet thick. Since no subsurface investigation was performed as a part of this study, the thickness and condition of the slopewash are unknown. The bedrock was exposed in the cut slopes of the existing parking lot, where it was found to be massive, with no discernable joint pattern. It is moderately to intensely weathered. It was gouged easily by a geologic pick, and was recovered as a friable silty coarse-grained sand. The intensity of the weathering is most likely the reason that cuts of up to 50 feet were achieved for the existing parking lot, reportedly without blasting, only with the use of conventional heavy grading equipment. The ability to achieve the proposed cuts of up to 68 feet without blasting is unknown.

4.0 EARTHWORK RECOMMENDATIONS

No structures are proposed for the subject site. If at a later date structures are proposed for the subject site, the plans should be reviewed by this office so additional recommendations can be prepared. Overexcavation of future building areas may be necessary, depending on the location of any proposed structure(s) with respect to the cut/fill transition line.

4.1 All Areas:

1. All vegetation, roots, debris, etc, should be removed from the areas to be graded.
2. Any undocumented fill should be removed, cleared of debris and oversized rock, and may then be reused as fill material. Oversized rock is defined in Section 4.2, Oversized Material, of this report.
3. All slopewash and alluvium should be removed from the areas to be graded to competent bedrock, cleared of oversized rock, and may then be reused as fill

material. The estimated depth of slopewash is approximately 1 to 2-feet. The estimated depth of alluvium in the smaller drainages is 3 to 5-feet, and 5 to 10-feet in the larger drainages.

4. All exposed removal and overexcavation bottoms should be inspected by the Project Geologist or his representative prior to placement of any fill. Bedrock bottoms should be probed to verify competency.

5. The approved exposed bottoms of all removal areas should be scarified 6 to 12-inches, brought to near optimum moisture content, and compacted to a minimum of 90 percent relative compaction before placement of fill. Maximum dry density and optimum moisture content for compacted materials should be determined according to ASTM D 1557-02 procedures.

6. A keyway should be constructed at the toe of all fill slopes that are proposed on natural grades of 5:1 (horizontal to vertical) or steeper. Keyways should be a minimum of two (2) feet deep and fifteen (15) feet wide (equipment width) and tilted a minimum of two percent into the hillside. Keyways for transition slopes should tilt a minimum of 5 percent into the hillside. A series of level benches should be constructed into competent bedrock on natural grades of 5:1 (horizontal to vertical) or steeper prior to placing fill.

7. All fill slopes should be constructed at slope ratios no steeper than 2:1 (horizontal to vertical). All cut slopes should be inspected by the Project Geologist to verify stability. Cut slopes exposing adverse structural features or significant amounts of soil may be considered unstable. Unstable cut slopes may require flattening or buttressing.

4.2 **Oversize Material:** Oversize material is defined as rock, or other irreducible material with a maximum dimension greater than 12-inches. Oversize material shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Project Geotechnical Engineer. Placement operations shall be such that nesting of oversize material does not occur, and such that oversize material is completely surrounded by compacted fill (windrow). Alternative methods, such as water jetting or wheel rolling with a backhoe may be required to achieve compaction in the fill materials immediately adjacent to the windrow. Oversize material shall not be placed within ten (10)

vertical feet of finish grade, within fifteen (15) lateral feet of a finished slope face, or within two feet of future utilities.

4.3 **Structural Fill:** All fill material, whether on-site material or import, should be accepted by the Project Geotechnical Engineer and/or his representative before placement. All fill should be free from vegetation, organic material, and other debris. Import fill should be no more expansive than the existing on-site material, unless approved by the Project Geotechnical Engineer. Approved fill material should be placed in horizontal lifts not exceeding 6.0 to 8.0-inches in thickness, and watered or aerated to obtain near-optimum moisture content (within 2.0 percent of optimum). Each lift should be spread evenly and should be thoroughly mixed to ensure uniformity of soil moisture. Structural fill should meet a minimum relative compaction of 90 percent of maximum dry density based upon ASTM D 1557-02 procedures. Moisture content of fill materials should not vary more than 2.0 percent of optimum, unless approved by the Project Geotechnical Engineer.

4.4 **Soil Expansion Potential:** Preliminary Expansion Index testing was performed, yielding an EI of 3. This is classified as a very low expansion potential. Import soils or soils used near finish grade may have a different EI. Final foundation design parameters for any proposed structures should be based on EI testing of near-surface soils and be performed at the conclusion of rough grading. Those results should be forwarded and incorporated into the final design by the Project Structural Engineer.

4.5 **Soluble Sulfates:** Test results (California Test Method 417 procedures) indicate a negligible concentration (0.0069%) of water soluble sulfates. As a result, normal Type II cement may be used in concrete that will come in contact with native soils.

5.0 SLOPE STABILITY – GENERAL

It is our professional opinion that cut or fill slopes no taller than 30-feet and inclined at 2:1 (horizontal to vertical) or flatter, will possess gross and surficial stability in excess of generally accepted minimum engineering criteria (Factor of Safety at least 1.5) and are suitable for their intended purpose, provided that proper slope maintenance procedures are maintained. These procedures include but are not limited to installation and maintenance of drainage devices and planting of slope faces to protect from erosion in accordance with County of Riverside Grading Codes.

5.1 **Fill Slopes:** It is our opinion that the fill slopes, as planned, will possess gross and surficial stability in excess of generally accepted minimum engineering criteria (Factor of Safety at least 1.5) and are suitable for their intended purpose, provided that proper slope maintenance procedures are maintained. These procedures include but are not limited to installation and maintenance of drainage devices and planting slope faces to protect from erosion in accordance with County of Riverside Grading Codes. The maximum height of the proposed fill slope covered in this report is 30-feet tall at an inclination of 2:1 (horizontal to vertical).

5.2 **Cut Slopes:** It is our opinion that cut slopes founded in massive granodiorite at inclinations of 2:1 (horizontal to vertical) or flatter will possess gross and surficial stability in excess of generally accepted minimum engineering criteria (Factor of Safety at least 1.5) and are suitable for their intended purpose. The supporting data follows in Section 6.0, Slope Stability Analysis, of this report. The maximum height of the cut slope covered in this report is 140-feet tall at an inclination of 3:1. The max height of a 2:1 cut slope is 38-feet. This slope has no terrace drain. Slope conditions exposed at the time of grading should be inspected by the Project Geologist. If adverse conditions are encountered, the slope may require buttressing or flattening.

6.0 SLOPE STABILITY ANALYSIS

6.1 **Slope Stability Evaluation:** Gross slope stability analyses were performed for 140-foot high 3:1 cut slope (Section X – X'),and the 38-foot high 2:1 cut slope (Section Y – Y'). The slopes were evaluated for gross stability under static and pseudostatic (seismic) conditions. In addition, surficial stability analyses were performed assuming that the upper 4-feet of the slope face is saturated, per County of Riverside Grading Codes. However, it is unlikely that the face will become saturated due to its hardness and proposed inclinations. The analyses performed were based on shear strength parameters derived from laboratory testing of proposed fill material for the proposed fill slope and assumed conservatively low shear strength parameters from the referenced Foundation Analysis and Design Textbook by Bowles (1996) for the proposed cut slopes. Therefore, the strength parameters used in the analysis are as follows:

Material Description	Phi Angle (degrees)	Cohesion (psf)
Granodiorite	40	1000

The computer program used to compute the safety factors for the gross slope stability under static and pseudostatic (seismic) conditions was Galena Slope Stability Analysis System by Dover Technology (2004). This program follows the limiting equilibrium circular surface method as described by A.W. Bishop called the "Simplified Bishop Method of Slices." The following tables present the calculated minimum factors of safety for the analysis conducted. The calculations for the analysis are presented in the Appendix.

Summary of Safety Factors for Gross Stability		
Section Analyzed	**Factor of Safety (Seismic)**	**Factor of Safety (Static)**
X – X' 3:1 cut slope	2.25	3.44
Y – Y' 2:1 cut slope	2.76	3.94

Summary of Safety Factors for Surficial Stability		
Section Analyzed	**Material Type**	**Factor of Safety**
X – X' 3:1 cut slope	Granodiorite	7.07
Y – Y' 2:1 cut slope	Granodiorite	4.97

6.2 **Slope Maintenance and Protection Recommendations:** Although the design and construction of slopes are planned to create slopes that possess stability against mass rotational failure, surficial slumping, creep, and pop-outs, and other factors are beyond the control of the Project Geotechnical Engineer. The following recommendations are presented for slope protection and maintenance.

6.2.1 **Surface Drainage:** Surface water should not be allowed to flow over the slopes other than incidental rainfall. No alteration of pad gradients should be allowed that will prevent pad and roof run-off from being expediently directed to approved disposal areas away from the tops of slopes.

6.2.2 **Slope Berms:** Top of slope berms should be constructed and compacted as part of finish grading and should be maintained by the resident and/or the property owner. The recommended drainage patterns should be established at the time of finish grading and maintained throughout the life of the structures.

6.2.3 **Off-Site Drainage:** Concentrated surface waters entering the property from off-site sources should be collected and directed to a permanent drainage system away from the top of slopes.

6.2.4 **Maintenance Responsibility:** Residents and/or the property owner are responsible for the maintenance and cleaning of all interceptor ditches, drainage terraces, downdrains and any other drainage devices that have been installed to promote slope stability. Ravelling of the weathered Granodiorite bedrock should be anticipated, therefore, continued maintenance of the slopes should be expected.

6.2.5 **Slope Protection:** For slopes that do not have exposed Granodiorite bedrock, it is recommended that slopes be planted with ground cover, shrubs and trees that possess deep, dense root structures that require a minimum of irrigation. It should be the responsibility of the landscape architect to provide such plants initially and of the resident to maintain such planting. Alteration of the planting scheme is at the resident's and/or property owner's risk. Unweathered Granodiorite bedrock is not considered suitable for the support of vegetation, therefore, planting may be omitted from slopes that expose unweathered Granodiorite bedrock.

6.2.6 **Excessive Irrigation:** If automatic sprinkler systems are installed on the slopes, their use should be adjusted to account for natural rainfall.

6.2.7 **Burrowing Animals:** The resident and/or the owner should maintain a program for the elimination of burrowing animals. This should be an on-going program to protect slope stability.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 **Seismic Design Parameters:** The following seismic parameters apply:

Name of Fault: Elsinore Fault (Temecula Segment)
Type of Fault: Type B Fault
Closest Distance to Fault: 3.6-kilometers
Soil Profile Type: SD

7.2 **Slab-on-Grade Recommendations:** The recommendations for exterior concrete slabs, excluding PCC pavement, are based upon a very low expansion potential for the supporting material as determined by Chapter 18 of the California Building Code.

Concrete slabs should be designed to minimize cracking as a result of shrinkage. Joints (isolation, contraction, and construction) should be placed in accordance with the American Concrete Institute (ACI) guidelines. Special precautions should be taken during placement and curing of all concrete slabs. Excessive slump (high water/cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could result in excessive shrinkage, cracking, or curling in the slabs. It is recommended that all concrete proportioning, placement, and curing be performed in accordance with ACI recommendations and procedures. Slab-on-grade reinforcement and thickness should be provided by the structural engineer based on structural considerations. Final expansion testing at completion of grading could cause a change in the slab-on-grade recommendations.

7.3 **Exterior Slabs:** All exterior concrete slabs cast on finish subgrade (patios, sidewalks, etc., with the exception of PCC pavement) should be a minimum of 4-inches nominal in thickness. Reinforcing in the slabs and the use of a compacted sand or gravel base beneath the slabs should be according to the current local standards. Subgrade soils should be moisture conditioned to at least optimum moisture content to a depth of 12-inches immediately before placing the concrete.

8.0 RETAINING WALL RECOMMENDATIONS

8.1 **Earth Pressures:** Retaining walls backfilled with non-expansive granular soil (EI=0) or very low expansive potential materials (Expansion Index of 20 or less) within a zone extending upward and away from the heel of the footing at a slope of 0.5:1 (horizontal to vertical) or flatter can be designed to resist the following static lateral soil pressures:

Condition	Level Backfill	2:1 Slope
Active	30 pcf	45 pcf
At Rest	60 pcf	--

Further expansion testing of potential backfill material should be performed at the time of retaining wall construction to determine suitability. Walls that are free to deflect 0.01 radian at the top may be designed for the above-recommended active condition. Walls that need to be restricted from this amount of movement should be assumed rigid and designed for the at-rest condition. The above values assume well-drained backfill and no buildup of hydrostatic pressure. Surcharge loads, dead and/or live, acting on the backfill behind the wall should also be considered in the design.

8.2 **Retaining Wall Design:** Retaining wall footings should be founded at a minimum depth of 12-inches below lowest adjacent grade into firm, competent, undisturbed, natural soil or compacted fill as standard foundations and may be designed for an allowable bearing value of 2,000 psf when founded in compacted fill and 3,000 psf when founded in unweathered bedrock (as long as the resultant force is located in the middle one-third of the footing). Allowable static lateral bearing pressure of 200 psf/ft may be used in compacted fill and 300 psf/ft may be used in unweathered bedrock. An allowable sliding resistance coefficient of friction of 0.35 is applicable for compacted fill and unweathered bedrock. When using the allowable lateral pressure and allowable sliding resistance, a Factor of Safety of 1.5 should be achieved.

8.3 **Subdrain:** A subdrain system should be constructed behind and at the base of retaining walls equal to or in excess of 5-feet in height to allow drainage and to prevent the buildup of excessive hydrostatic pressures. Gravel galleries and/or filter rock, if not properly designed and graded for the on-site and/or import materials, should be enclosed in a geotextile fabric such as Mirafi 140N, Supac 4NP, or a suitable substitute in order to prevent infiltration of fines and clogging of the system. The perforated pipes should be at least 4.0-inches in diameter. Pipe perforations should be placed downward. Gravel filters should have volume of at least 1.0 cubic foot per lineal foot of pipe. For retaining walls with an overall height of less than 5-feet, subdrains may include weep holes with a continuous gravel gallery, perforated pipe surrounded by filter rock, or some other approved system. Subdrains should maintain a positive flow gradient and have outlets that drain in a non-erosive manner.

8.4 **Backfill:** Backfill directly behind retaining walls (if backfill width is less than 3-feet) may consist of 0.5 to 0.75-inch diameter, rounded to subrounded gravel enclosed in a geotextile fabric such as Mirafi 140N, Supac 4NP, or a suitable substitute or a clean sand (Sand Equivalent Value greater than 50) water jetted into place to obtain proper compaction. If water jetting is used, the subdrain system should be in place. Even if water jetting is used, the sand should be densified to a minimum of 90 percent relative compaction. If the specified density is not obtained by water jetting, mechanical methods will be required. If other types of soil or gravel are used for backfill, mechanical compaction methods will be required to obtain a relative compaction of at least 90 percent of maximum dry density. Backfill directly behind retaining walls should not be compacted

by wheel, track or other rolling by heavy construction equipment unless the wall is designed for the surcharge loading. If gravel, clean sand or other imported backfill is used behind retaining walls, the upper 18-inches of backfill in unpaved areas should consist of typical on-site material compacted to a minimum of 90 percent relative compaction in order to prevent the influx of surface runoff into the granular backfill and into the subdrain system. Maximum dry density and optimum moisture content for backfill materials should be determined in accordance with ASTM D 1557-02 procedures.

9.0 MISCELLANEOUS RECOMMENDATIONS

9.1 **Utility Trench Recommendations:** Utility trenches within the zone of influence of foundations or under hardscape, and/or pavement areas should be backfilled with properly compacted soil. It is recommended that all utility trenches excavated to depths of 5.0-feet or deeper be cut back to an inclination not steeper than 1:1 (horizontal to vertical) or be adequately shored during construction. Where utility trenches are proposed parallel and/or perpendicular to any footing, the bottom of the trench should not be located below a 1:1 plane projected downward from the outside bottom edge of the adjacent footing unless the utility lines are designed for the footing surcharge loads. Backfill material should be placed in a lift thickness appropriate for the type of backfill material and compaction equipment used. Backfill material should be compacted to a minimum of 90 percent relative compaction by mechanical means. Jetting of the backfill material will not be considered a satisfactory method for compaction. Maximum dry density and optimum moisture content for backfill material should be determined according to ASTM D 1557-02 procedures.

9.2 **Finish Lot Drainage Recommendations:** Finish lot surface gradients in unpaved areas should be provided next to tops of slopes to direct surface water away from foundations and slabs and from flowing over the tops of slopes. The surface water should be directed toward suitable drainage facilities. Ponding of surface water should not be allowed on pavements. In unpaved areas, a minimum positive gradient of 4.0 percent away from tops of slopes for a minimum distance of 3.0-feet and a minimum of 1.0 percent pad drainage off the property in a non-erosive manner should be provided.

9.3 **Planter Recommendations:** Planters should be designed with proper surface slope to ensure that adequate drainage is maintained and minimal irrigation water is allowed to percolate into the soils.

9.4 **Supplemental Construction Observations and Testing:** Any subsequent grading for development of the subject property should be performed under engineering observation and testing performed by **EnGEN Corporation.** Subsequent grading includes, but is not limited to, any additional overexcavation of cut and/or cut/fill transitions, fill placement, and excavation of temporary and permanent cut and fill slopes. In addition, **EnGEN Corporation**, should observe all foundation excavations. Observations should be made prior to installation of concrete forms and/or reinforcing steel to verify and/or modify, if necessary, the conclusions and recommendations in this report. Observations of overexcavation cuts, fill placement, finish grading, utility or other trench backfill, pavement subgrade and base course, retaining wall backfill, slab presaturation, or other earthwork completed for the development of subject property should be performed by **EnGEN Corporation.** If any of the observations and testing to verify site geotechnical conditions are not performed by **EnGEN Corporation**, liability for the safety and performance of the development is limited to the actual portions of the project observed and/or tested by **EnGEN Corporation.**

9.5 **Plan Review:** Subsequent to formulation of final plans and specifications for the project but before bids for construction are requested, grading and foundation plans for the proposed development should be reviewed by **EnGEN Corporation** to verify compatibility with site geotechnical conditions and conformance with the recommendations contained in this report. If **EnGEN Corporation** is not accorded the opportunity to make the recommended review, we will assume no responsibility for misinterpretation of the recommendations presented in this report.

9.6 **Pre-Bid Conference:** It is recommended that a pre-bid conference be held with the owner or an authorized representative, the Project Architect, the Project Civil Engineer, the Project Geotechnical Engineer and the proposed contractors present. This conference will provide continuity in the bidding process and clarify questions relative to the supplemental grading and construction requirements of the project.

9.7 **Pre-Grading Conference:** Before the start of any grading, a conference should be held with the owner or an authorized representative, the contractor, the Project Architect, the Project Civil Engineer, and the Project Geotechnical Engineer present. The purpose of this meeting should be to clarify questions relating to the intent of the supplemental grading recommendations and to verify that the project specifications comply with the recommendations of this geotechnical engineering report. Any special grading procedures and/or difficulties proposed by the contractor can also be discussed at that time.

10.0 CLOSURE

This report has been prepared for use by the parties or project named or described in this document. It may or may not contain sufficient information for other parties or purposes. In the event that changes in the assumed nature, design, or location of the proposed structure and/or project as described in this report, are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions and recommendations of this report are modified or verified in writing. This study was conducted in general accordance with the applicable standards of our profession and the accepted soil and foundation engineering principles and practices at the time this report was prepared. No other warranty, implied or expressed beyond the representations of this report, is made. Although every effort has been made to obtain information regarding the geotechnical and subsurface conditions of the site, limitations exist with respect to the knowledge of unknown regional or localized off-site conditions that may have an impact at the site. The recommendations presented in this report are valid as of the date of the report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or to the works of man on this and/or adjacent properties. If conditions are observed or information becomes available during the design and construction process that are not reflected in this report, **EnGEN Corporation** should be notified so that supplemental evaluations can be performed and the conclusions and recommendations presented in this report can be modified or verified in writing. Changes in applicable or appropriate standards of care or practice occur, whether they result from legislation or the broadening of knowledge and experience. Accordingly, the conclusions and recommendations presented in this report may be invalidated, wholly or in part, by changes outside of the control of **EnGEN Corporation** which occur in the future.

TECHNICAL REFERENCES

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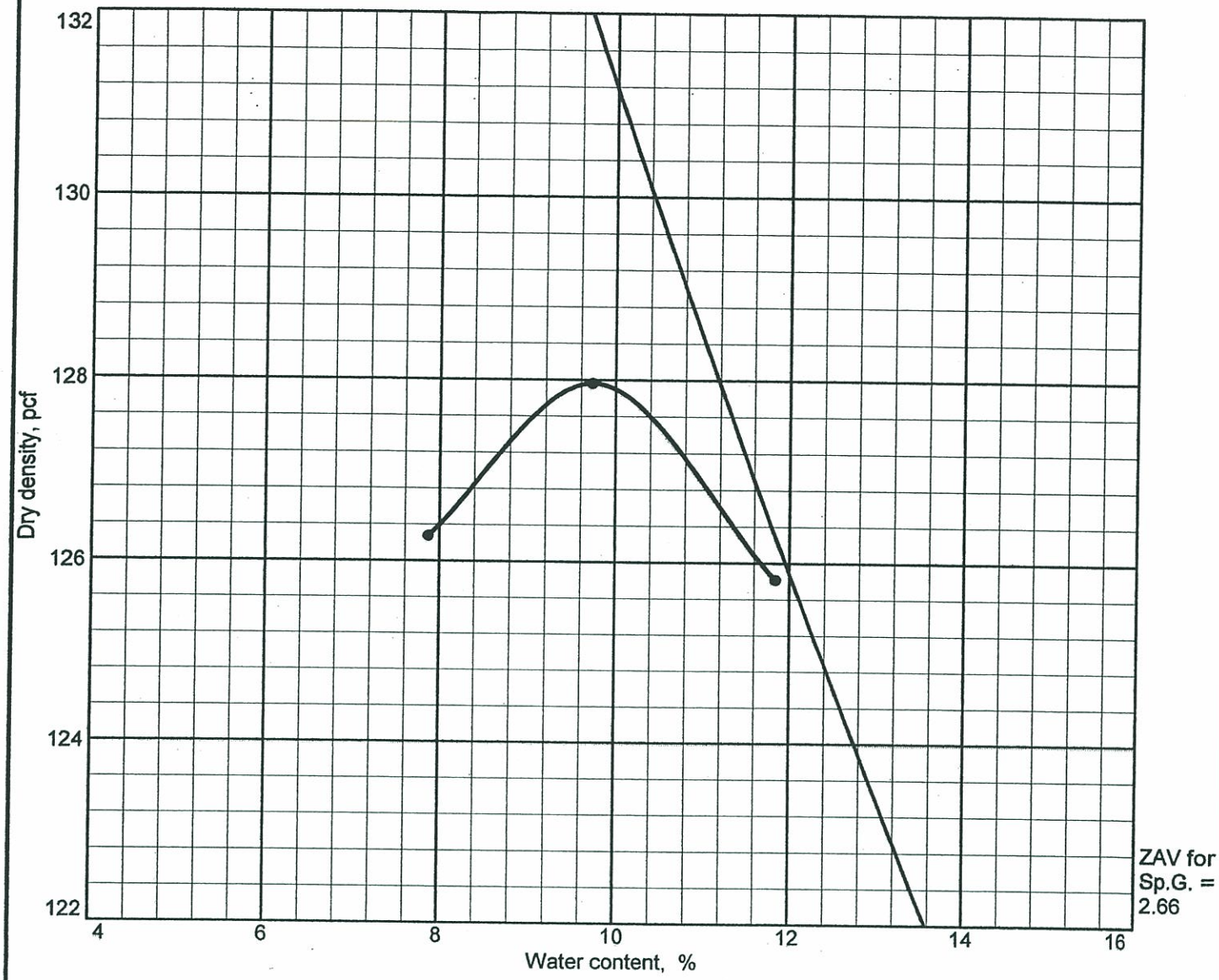
LABORATORY TEST RESULTS

COMPACTION TEST REPORT



Test specification: ASTM D 1557-02 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SM		3.8					

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 128.0 pcf Optimum moisture = 9.7 %	SILTY SAND,LIGHT BROWN

Project No. T3477-GFS **Client:** MDMG
Project: CORNERSTONE COMMUNITY CHURCH
Location: LAKE ELSINORE

Remarks:
SAMPLE A
N.E OF EXISTING PARKING LOT
COLL BY CM
COLL ON 1-16-06

COMPACTION TEST REPORT
ENVIRONMENTAL AND GEOTECHNICAL ENGINEERING NETWORK CORPORATION

Figure

UBC Laboratory Expansion Test Results

1/19/2006

Job Number: T3477-GFS
Job Name: MDMG - CORNERSTONE CHURCH
Location: MONTE VISTA DRIVE
Sample Source: A (N.E. OF EXISTING PARKING)
Sampled by: CM (1-16-06)
Lab Technician: AS
Sample Descr: SILTY SAND, LIGHT BROWN

Wet Compacted Wt.:	597
Ring Wt.:	185.9
Net Wet Wt.:	411.1
Wet Density:	124.2
Wet Soil:	170.8
Dry Soil:	153.9
Initial Moisture (%):	11.0%
Initial Dry Density:	111.9
% Saturation:	58.6%
Final Wt. & Ring Wt.:	599.9
Net Final Wt.:	414.0
Dry Wt.:	370.4
Loss:	43.6
Net Dry Wt.:	366.0
Final Density:	110.5
Saturated Moisture:	11.9%

	Dial	Change	Time
Reading 1:	0.100	N/A	2:30
Reading 2:	0.100	0.000	2:45
Reading 3:	0.099	-0.001	3:00
Reading 4:	0.099	-0.001	17-Jan

Expansion Index:	0
Adjusted Index: (UBC 18-2)	3.5

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41607 Enterprise Circle North
Temecula, CA 92590
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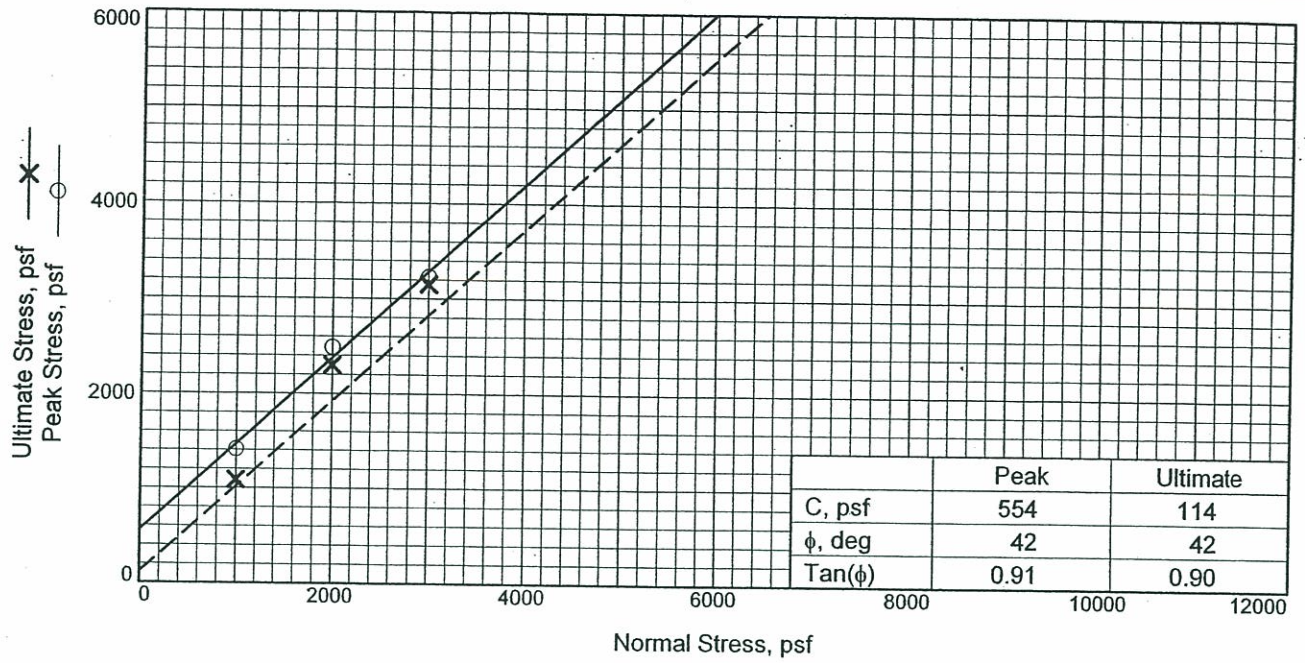
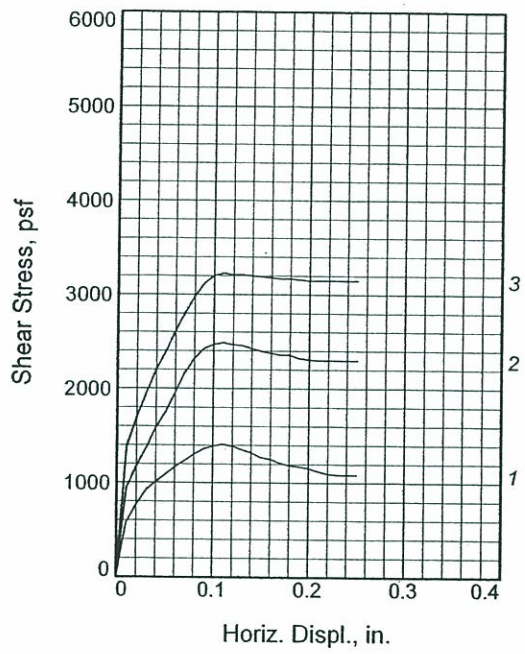
Fax: (951) 296-2237



	Peak	Ultimate
C, psf	554	114
ϕ, deg	42	42
Tan(ϕ)	0.91	0.90



	Sample No.	1	2	3
Initial	Water Content, %	9.7	9.7	9.7
	Dry Density, pcf	115.0	115.0	115.0
	Saturation, %	58.1	58.1	58.1
	Void Ratio	0.4442	0.4442	0.4442
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	N/A	N/A	N/A
	Dry Density, pcf			
	Saturation, %			
	Void Ratio			
	Diameter, in.			
	Height, in.			
	Normal Stress, psf	1000	2000	3000
	Peak Stress, psf	1409	2484	3228
	Displacement, in.	0.11	0.11	0.11
	Ultimate Stress, psf	1086	2299	3150
	Displacement, in.	0.23	0.21	0.20
	Strain rate, in./min.	0.20	0.20	0.20

Sample Type: REMOLDED
Description: SILTY SAND, TAN

Specific Gravity= 2.66
Remarks: N.E. OF PARKING LOT
COLLECTED BY CM
COLLECTED ON (1/16/06)

Figure _____

Client: MDMG

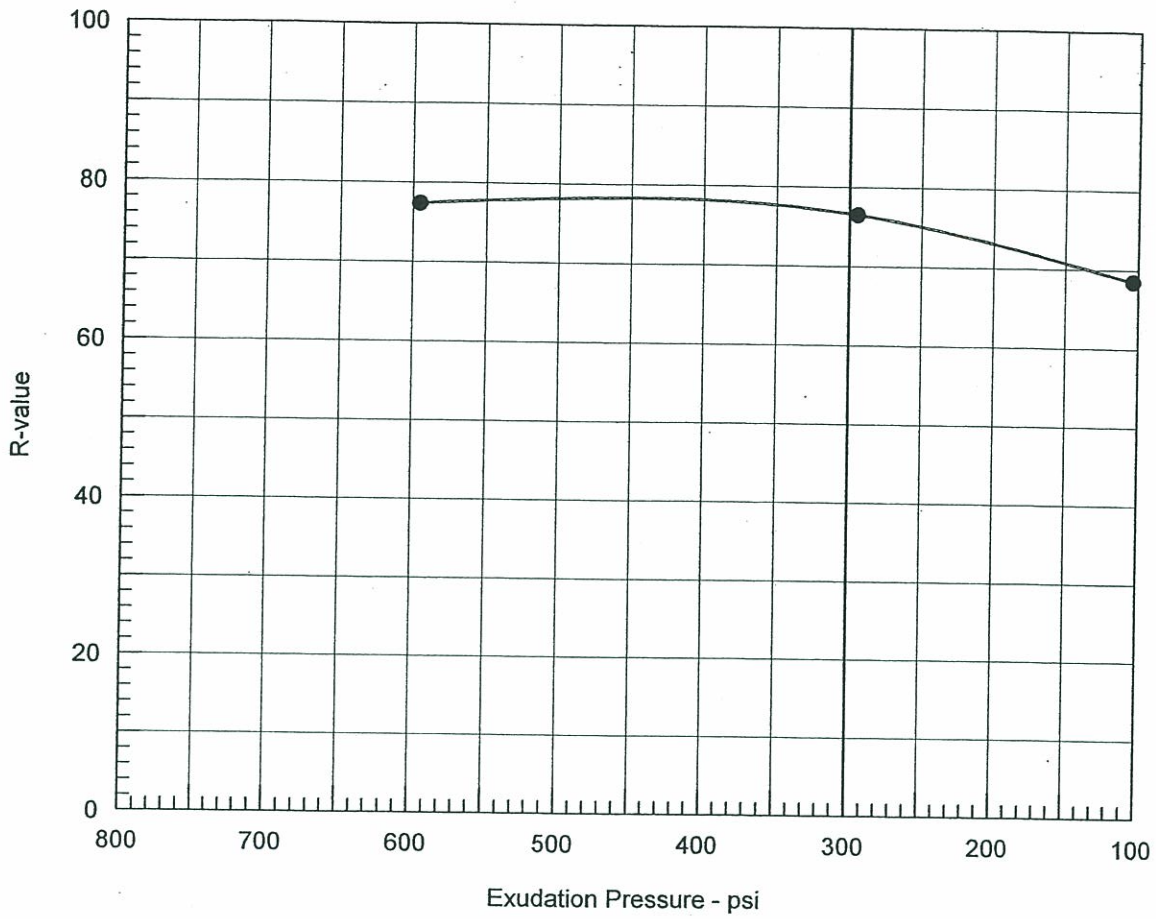
Project: CORNERSTONE COMMUNITY CHURCH

Source of Sample: SHEAR
Sample Number: A
Proj. No.: T3477-GFS **Date:** 1/24/06

DIRECT SHEAR TEST REPORT
ENVIRONMENTAL AND GEOTECHNICAL
ENGINEERING NETWORK CORPORATION

Tested By: AS **Checked By:** JH

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	125.8	10.2	1.21	27	2.57	294	75	77
2	350	125.4	11.4	0.00	37	2.54	103	69	69
3	350	126.0	9.1	1.82	24	2.60	595	76	77

Test Results	Material Description
R-value at 300 psi exudation pressure = 77	SAND, TAN

Project No.: T3477-GFS
Project: CORNERSTONE COMMUNITY CHURCH
Source of Sample: R-VALUE
Sample Number: A
Date: 1/26/2006

Tested by: JH
Checked by: JH
Remarks:
N.E. OF EXISTING PARKING
COLLECTED BY CM
COLLECTED ON (1/16/06)

R-VALUE TEST REPORT

EnGEN Corporation

Figure 1

E.S. BABCOCK & SONS, INC.
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Celebrating a Century of Reliable Data

NELAP #02101CA ELAP#1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (951) 653-3351 FAX (951) 653-1662
www.babcocklabs.com

Client Name: Engen, Inc.
Contact: Engen, Inc.
Address: 41607 Enterprise Circle N.
Temecula, CA 92590-5614

Report Date: 02-Feb-2006

Project Name: Engen - Sulfate
Project Number: Purchase Order #2947

Work Order Number: A6A2449
Received on Ice (Y/N): No Temp: °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department at the phone number above.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A6A2449-01	A T3477-GFS MDMG Cornerstone	Soil	01/25/06 00:00		01/26/06 10:08	Courier

ACCREDITED IN ACCORDANCE WITH nelac

E.S. BABCOCK & SONS, INC.
Established 1906

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Address: 41607 Enterprise Circle N.
Temecula, CA 92590-5614

Report Date: 02-Feb-2006

Project Name: Engen - Sulfate
Project Number: Purchase Order #2947

Work Order Number: A6A2449
Received on Ice (Y/N): No Temp: °C

Laboratory Reference Number
A6A2449-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
A T3477-GFS MDMG Cornerstone	Soil	01/25/06 00:00	01/26/06 10:08

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Water Extract							
Sulfate	69	10	ppm	Ion Chromat.	01/31/06 20:21	CTH	N-SAG, N_WEX

ACCREDITED IN ACCORDANCE WITH nelac

E.S. BABCOCK & SONS, INC.
Established 1906

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Report Date: 02-Feb-2006

Project Name: Engen - Sulfate
Project Number: Purchase Order #2947

Work Order Number: A6A2449
Received on Ice (Y/N): No Temp: °C

Notes and Definitions

N_WEX Analyte determined on a 1:10 water extract from the sample.

N-SAG Results reported in ppm are expressed on an air dried soil basis.

ND Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reporting Limit (RL)

NR Not Reported

RDL = Reportable Detection Limit MDL = Method Detection Limit

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

Lawrence Chrystal

☐ James K. Babcock
President

☐ Allison Mackenzie
General Manager

☑ Lawrence J. Chrystal
Laboratory Director

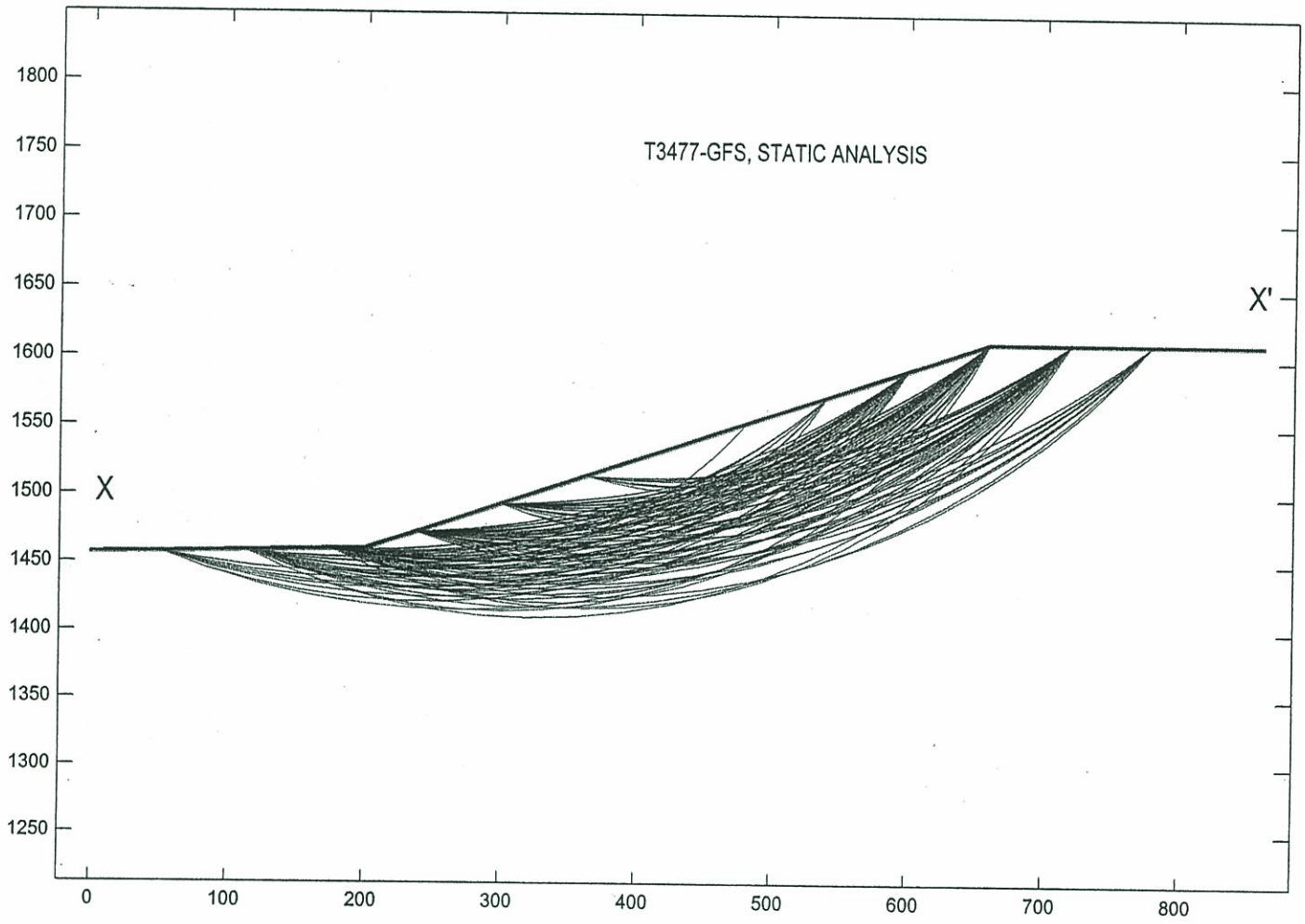
cc:

ESB_Short_5.5 Report

ACCREDITED IN ACCORDANCE WITH nelac

SLOPE STABILITY CALCULATIONS

GALENA Version 4.00



Analysis: 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical (minimum)

Factor of Safety: 3.44

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
T3477-GFS MDMG, Cornerstone - Static Analysis

File: C:\SLOPE STABILITY\T3477-GFS X-X', static.gmf

EnGEN Corporation

Galena 4.0 Multiple Analysis Result Summary Licensee: EnGEN Corporation

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
File: C:\SLOPE STABILITY\T3477-GFS X-X', static.gmf Processed: 15:08:16 03 Feb 2006

Analysis 1 - T3477-GFS MDMG, Cornerstone - Static Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

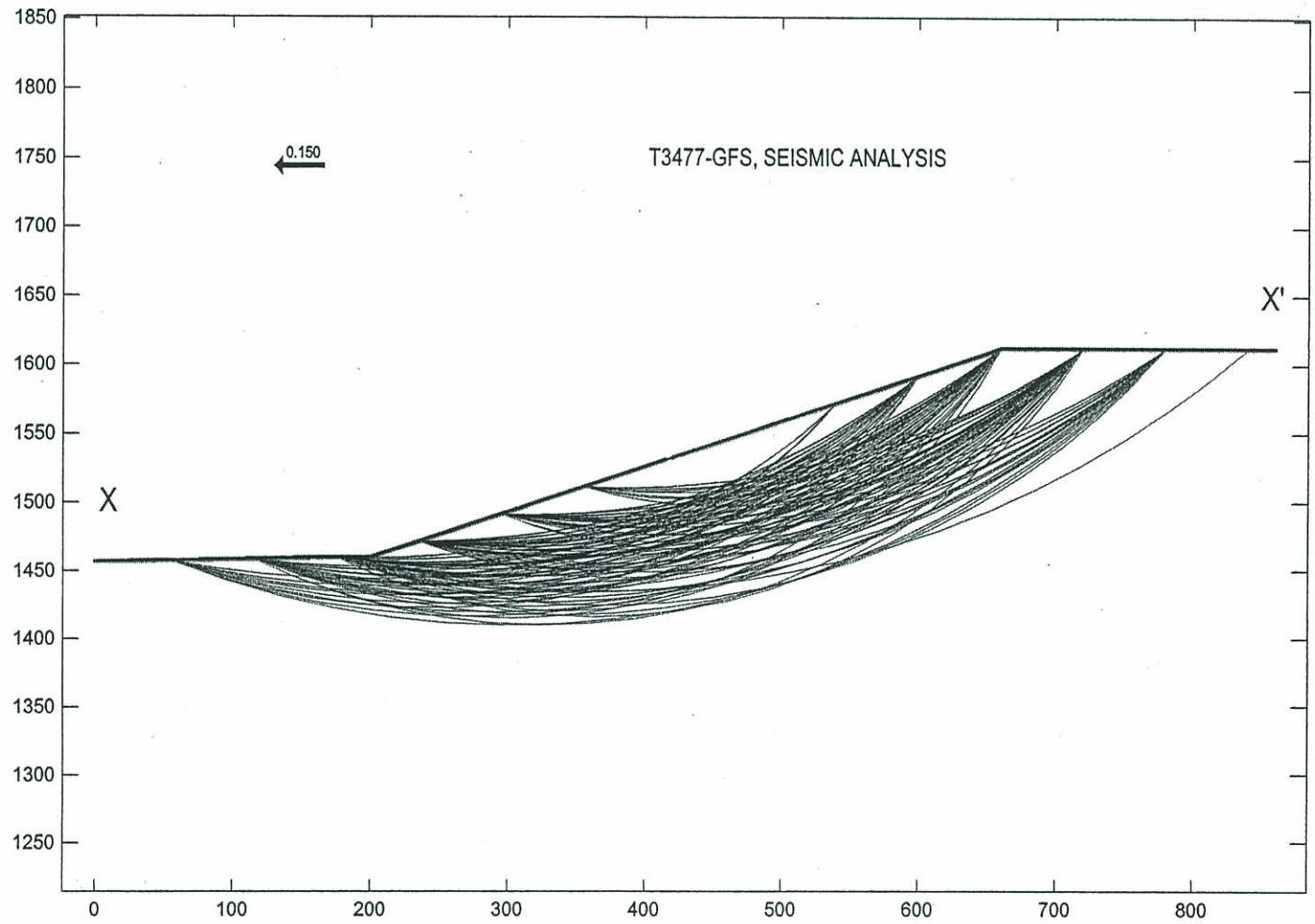
Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.45
There were: 436 successful analyses from a total of 729 trial circles
293 analyses aborted due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.44

Circle and Results Summary (Lowest 20 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	X-Right	Radius	FoS
1	285.06	2117.73	175.00	719.75	666.88	3.444
2	267.23	2181.63	175.00	719.75	727.50	3.445
3	293.96	1930.18	175.00	660.00	485.00	3.451
4	303.25	2052.53	175.00	719.75	606.25	3.459
5	313.50	1951.36	237.50	660.00	485.00	3.467
6	292.40	2015.21	237.50	660.00	545.63	3.481
7	335.34	1885.30	237.50	660.00	424.38	3.490
8	306.78	2135.62	237.50	719.75	666.88	3.490
9	325.13	2072.24	237.50	719.75	606.25	3.491
10	321.96	1985.46	175.00	719.75	545.63	3.499
11	288.70	2198.05	237.50	719.75	727.50	3.500
12	343.88	2007.51	237.50	719.75	545.63	3.509
13	271.77	2077.63	237.50	660.00	606.25	3.516
14	255.47	2172.09	112.50	719.75	727.50	3.525
15	315.86	1860.32	175.00	660.00	424.38	3.525
16	260.02	1937.49	175.00	600.25	485.00	3.533
17	272.07	2106.27	112.50	719.75	666.88	3.535
18	280.63	1871.02	175.00	600.25	424.38	3.538
19	363.20	1940.78	237.50	719.75	485.00	3.558
20	241.93	2051.04	112.50	660.00	606.25	3.562



GALENA Version 4.00

Analysis: 1
Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results
Critical (minimum)
Factor of Safety: 2.25

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
T3477-GFS MDMG, Cornerstone - Seismic Analysis
File: C:\SLOPE STABILITY\T3477-GFS X-X', seismic.gmf

EnGEN Corporation

Galena 4.0 Multiple Analysis Result Summary Licensee: EnGEN Corporation

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
File: C:\SLOPE STABILITY\T3477-GFS X-X', seismic.gmf Processed: 15:56:05 03 Feb 2006

Analysis 1 - T3477-GFS MDMG, Cornerstone - Seismic Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

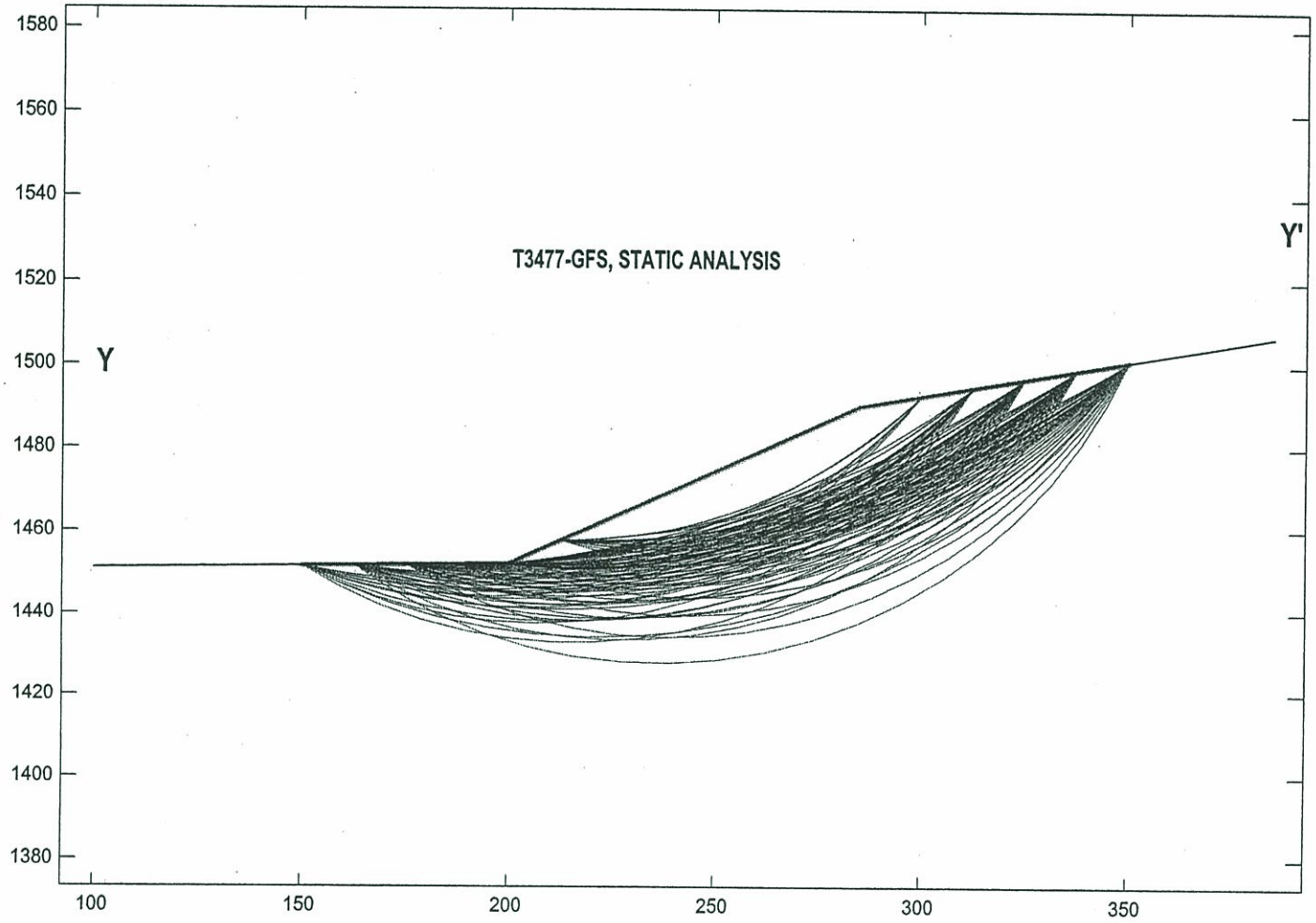
Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 2.29
There were: 444 successful analyses from a total of 729 trial circles
285 analyses aborted due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.25

Circle and Results Summary (Lowest 20 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	X-Right	Radius	FoS
1	267.44	2181.60	175.00	720.00	727.50	2.251
2	285.27	2117.70	175.00	720.00	666.88	2.252
3	303.45	2052.49	175.00	720.00	606.25	2.264
4	305.79	2134.64	235.00	720.00	666.88	2.274
5	324.16	2071.19	235.00	720.00	606.25	2.277
6	287.69	2197.12	235.00	720.00	727.50	2.278
7	293.96	1930.18	175.00	660.00	485.00	2.289
8	256.20	2172.48	115.00	720.00	727.50	2.290
9	342.94	2006.37	235.00	720.00	545.63	2.292
10	322.16	1985.40	175.00	720.00	545.63	2.293
11	272.84	2106.74	115.00	720.00	666.88	2.296
12	312.47	1950.30	235.00	660.00	485.00	2.298
13	291.34	2014.24	235.00	660.00	545.63	2.306
14	334.35	1884.11	235.00	660.00	424.38	2.317
15	289.92	2039.28	115.00	720.00	606.25	2.317
16	270.68	2076.73	235.00	660.00	606.25	2.328
17	362.30	1939.53	235.00	720.00	485.00	2.329
18	317.35	2173.44	175.00	780.00	727.50	2.333
19	242.44	2051.52	115.00	660.00	606.25	2.337
20	261.28	1984.47	115.00	660.00	545.63	2.339



GALENA Version 4.00

Analysis: 1
Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results
Critical (minimum)
Factor of Safety: 3.94

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
T3477-GFS MDMG, Cornerstone - Static Analysis
File: C:\SLOPE STABILITY\T3477-GFS Y-Y', static.gmf

EnGEN Corporation

Galena 4.0 Multiple Analysis Result Summary Licensee: EnGEN Corporation

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
File: C:\SLOPE STABILITY\T3477-GFS Y-Y', static.gmf Processed: 11:25:45 28 Feb 2006

Analysis 1 - T3477-GFS MDMG, Cornerstone - Static Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

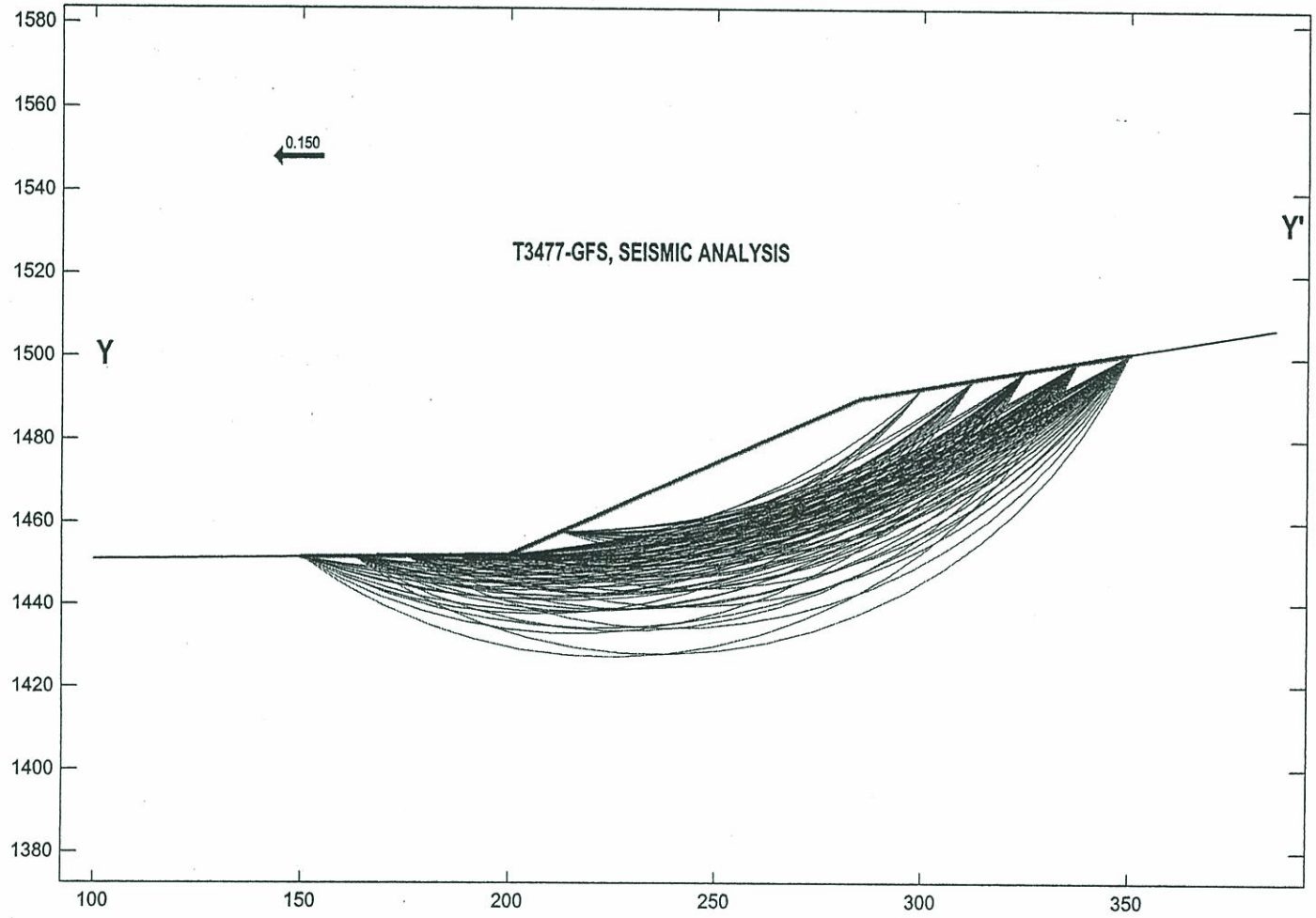
Factor of Safety for initial failure circle approximation: 5.19
There were: 492 successful analyses from a total of 729 trial circles
237 analyses aborted due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.94

Negative normal stresses exist on the base of one or more slices - examine slice data and consult th

Circle and Results Summary (Lowest 20 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	X-Right	Radius	FoS
1	217.39	1575.78	200.00	312.50	125.00	3.940
2	226.77	1574.10	200.00	325.00	125.00	3.966
3	224.59	1571.25	187.50	325.00	125.00	3.994
4	215.62	1573.67	187.50	312.50	125.00	3.998
5	214.78	1607.55	200.00	325.00	156.25	4.029
6	224.07	1606.38	200.00	337.50	156.25	4.062
7	221.98	1567.59	175.00	325.00	125.00	4.080
8	207.63	1576.77	200.00	300.00	125.00	4.083
9	235.89	1571.74	200.00	337.50	125.00	4.083
10	222.08	1604.25	187.50	337.50	156.25	4.083
11	213.24	1605.99	187.50	325.00	156.25	4.087
12	213.30	1570.74	175.00	312.50	125.00	4.089
13	205.10	1608.17	200.00	312.50	156.25	4.091
14	233.41	1568.14	187.50	337.50	125.00	4.098
15	219.63	1601.49	175.00	337.50	156.25	4.132
16	212.92	1639.05	200.00	337.50	187.50	4.134
17	230.75	1602.02	187.50	350.00	156.25	4.149
18	233.08	1604.71	200.00	350.00	156.25	4.150
19	203.34	1639.47	200.00	325.00	187.50	4.152
20	211.11	1603.77	175.00	325.00	156.25	4.153



GALENA Version 4.00

Analysis: 1
Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results
Critical (minimum)
Factor of Safety: 2.76

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
T3477-GFS MDMG, Cornerstone - Seismic Analysis
File: C:\SLOPE STABILITY\T3477-GFS Y-Y', seismic.gmf

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Galena 4.0 Multiple Analysis Result Summary Licensee: EnGEN Corporation

Project: T3477-GFS Markham Devel. Mgmt. Group, Cornerstone Church
File: C:\SLOPE STABILITY\T3477-GFS Y-Y', seismic.gmf Processed: 11:32:14 28 Feb 2006

Analysis 1 - T3477-GFS MDMG, Cornerstone - Seismic Analysis

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.74
There were: 492 successful analyses from a total of 729 trial circles
237 analyses aborted due to unacceptable geometry

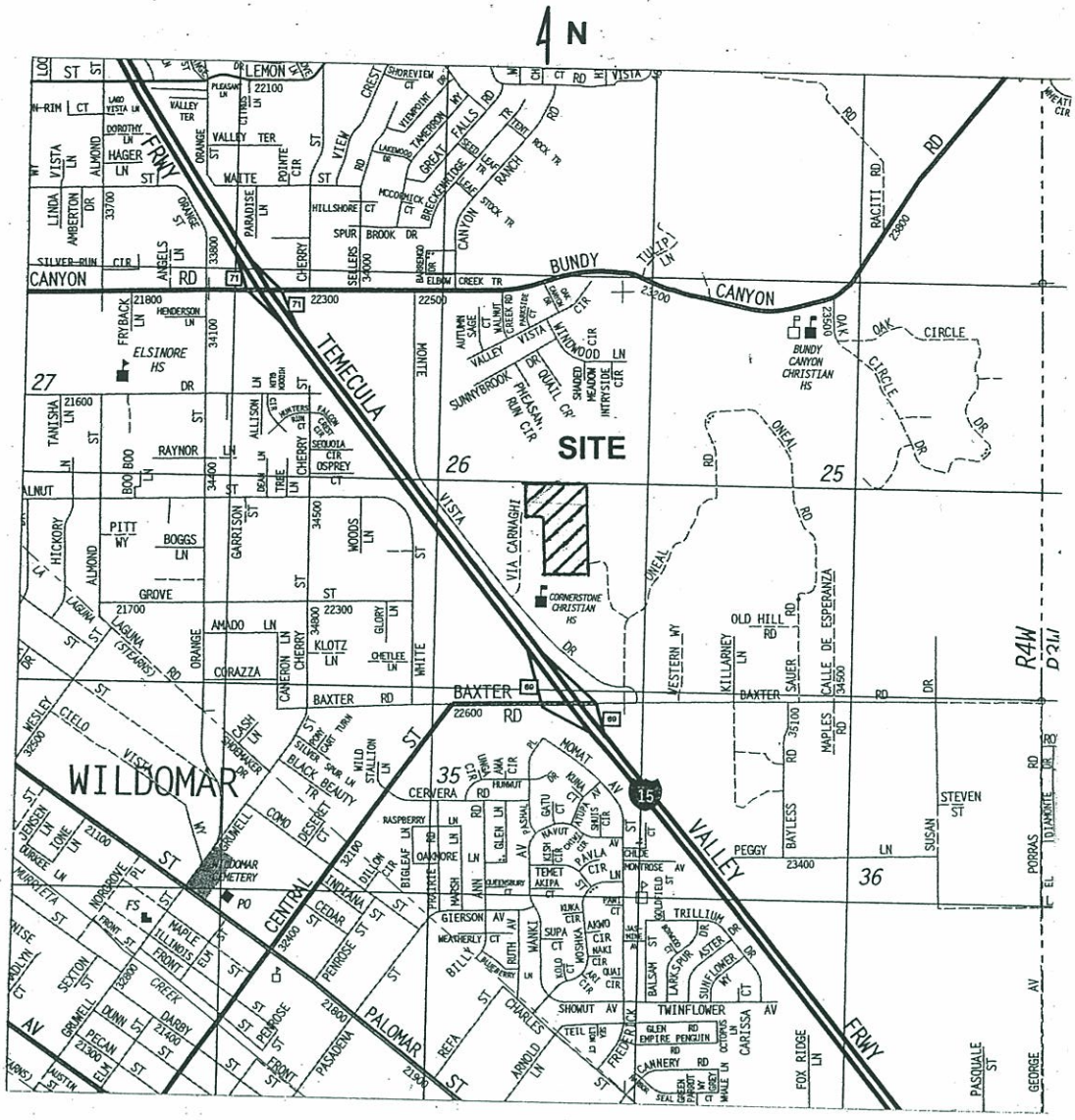
Critical (minimum) Factor of Safety: 2.76

Negative normal stresses exist on the base of one or more slices - examine slice data and consult th

Circle and Results Summary (Lowest 20 Factor of Safety circles)

Circle	X-Centre	Y-Centre	X-Left	X-Right	Radius	FoS
1	226.77	1574.10	200.00	325.00	125.00	2.755
2	224.07	1606.38	200.00	337.50	156.25	2.772
3	224.59	1571.25	187.50	325.00	125.00	2.780
4	217.39	1575.78	200.00	312.50	125.00	2.783
5	233.08	1604.71	200.00	350.00	156.25	2.788
6	235.89	1571.74	200.00	337.50	125.00	2.792
7	222.08	1604.25	187.50	337.50	156.25	2.794
8	214.78	1607.55	200.00	325.00	156.25	2.796
9	230.75	1602.02	187.50	350.00	156.25	2.797
10	222.14	1638.19	200.00	350.00	187.50	2.801
11	233.41	1568.14	187.50	337.50	125.00	2.811
12	212.92	1639.05	200.00	337.50	187.50	2.819
13	228.04	1598.72	175.00	350.00	156.25	2.821
14	219.63	1601.49	175.00	337.50	156.25	2.821
15	220.33	1636.48	187.50	350.00	187.50	2.824
16	215.62	1573.67	187.50	312.50	125.00	2.826
17	221.98	1567.59	175.00	325.00	125.00	2.827
18	213.24	1605.99	187.50	325.00	156.25	2.841
19	218.03	1634.24	175.00	350.00	187.50	2.844
20	211.59	1670.44	200.00	350.00	218.75	2.846

DRAWINGS



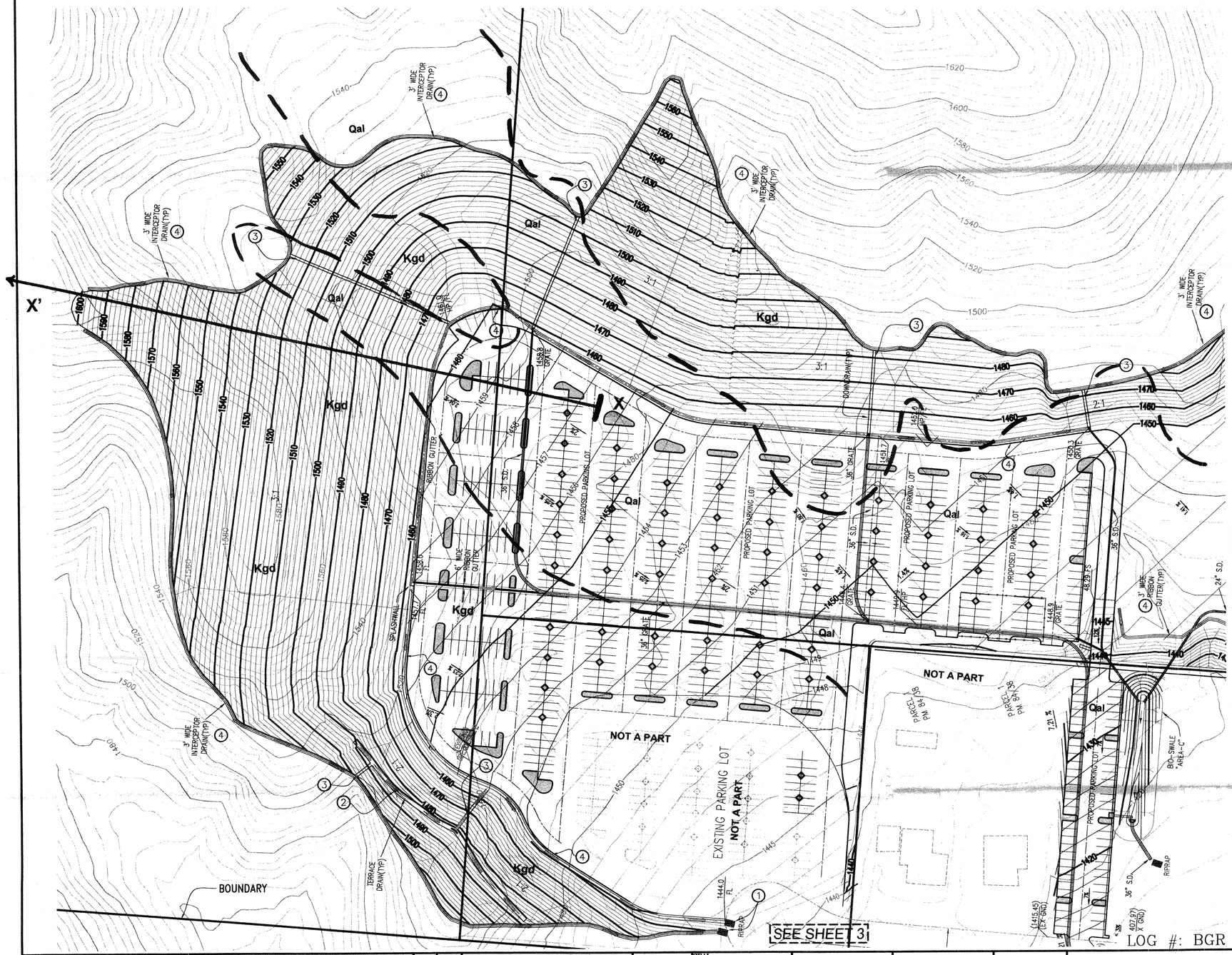
EnGEN Corporation

Geotechnical Engineering | Engineering Geology | Special Inspection | Material Testing | Environmental Assessments

VICINITY MAP			
PROJECT NUMBER:	T3477-GFS	LEGAL DESCRIPTION:	APN 367-210-018 and 367-140-008
DATE: MARCH 2006		SCALE: 1"=2400'	
CLIENT NAME:	MARKHAM DEVEL. MGMT. GROUP, INC.	FIGURE:	1

BASE MAP: Thomas Guide, 2005, Riverside Co., pg 897

ROUGH GRADING PLANS
P.U.P. NO. 778



LEGEND

- APPROXIMATE LOCATION OF GEOLOGIC CONTACT
- Qal ALLUVIUM
- Kgd GRANODIORITE
- X — X' LOCATION OF SLOPE STABILITY CROSS SECTION
- Y — Y'

EnGEN Corporation — Geotechnical Engineering, Engineering Geology, Special Inspection, Material Testing, Environmental Assessments

GEOTECHNICAL FEASIBILITY STUDY SITE PLAN			
PROJECT NUMBER: T3477-GFS	LEGAL DESCRIPTION:	APN 367-210-018 and 367-140-008	
DATE: MARCH 2006	SCALE: 1"= 60'		
CLIENT NAME: MARKHAM DEVEL. MGMT. GROUP, INC.	PLATE:	1 of 3	

CONSTRUCTION NOTES

1. INSTALL 10' x 10' 1/4 TON RIP-RAP ENERGY DISSIPATOR
2. CONSTRUCT TERRACE DRAIN PER C.O.M. STD. NO. 415a
3. CONSTRUCT DOWNDRAIN PER C.O.M. STD. NO. 415b
4. CONSTRUCT INTERCEPTOR DRAIN PER C.O.M. STD. NO. 432

MDMG
MARKHAM DEVELOPMENT MANAGEMENT GROUP, INC.
41635 Enterprise Circle N. - Suite B
Temecula, California 92590
(951) 296-3466 TEL (951) 296-3476 FAX

LOG #: BGR

CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE
Contractor					
Inspector					
Date Completed					

BENCHMARK R-S
ALUMINUM DISC IN CONCRETE POST APPROX. 0.45 MILES N.W.'LY FROM THE POST OFFICE AT MURRIETA, CA. N.E. OF THE TEE INTERSECTION OF KALMIA ST. AND 2nd AVE., 31 FEET N.E.'LY OF THE CENTERLINE ON 2nd AVE., 31 FEET S.E.'LY OF CENTERLINE OF KALMIA ST., 56 FEET S.E.'LY OF PP NO. 1594267E, 2 FEET N.W.'LY OF END OF BLOCK WALL, 5 FEET N.E.'LY OF A 4"x4" STREET SIGN POST. RESET 1983
ELEVATION = 1094.817

SCALE: Horizontal — AS SHOWN; Vertical — N/A

SEAL: REGISTERED PROFESSIONAL ENGINEER — LARRY R. MARKHAM — No. 30657 — Exp. 3-31-06 — CIVIL — STATE OF CALIFORNIA

Designed By	Drawn By	Checked By
CAG	CAG	BWL

These Plans Were Prepared Under The Supervision Of:
L. R. MARKHAM R.C.E. No. 30657 Expires: 3-31-06 Date

Recommended By: Date:
Accepted By: Date:
R.C.E. No. Expires:

COUNTY OF RIVERSIDE — DEPARTMENT OF BUILDING & SAFETY
TITLE SHEET
ROUGH GRADING & EROSION CONTROL PLANS
FOR:
P.U.P. NO. 778

Date: 1/5/06
GR-
Sheet 2 of 8

JN 1280

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ROUGH GRADING PLANS
P.U.P. NO. 778

CONSTRUCTION NOTES

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3. CONSTRUCT DOWNDRAIN PER C.O.M. STD. NO. 415b
4. CONSTRUCT INTERCEPTOR DRAIN PER C.O.M. STD. NO. 432

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

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41635 Enterprise Circle N. - Suite B
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(951) 296-3466 TEL (951) 296-3476 FAX

EnGEN Corporation

GEOTECHNICAL FEASIBILITY STUDY SITE PLAN			
PROJECT NUMBER:	T3477-GFS	LEGAL DESCRIPTION:	APN 367-210-018 and 367-140-008
DATE: MARCH 2006		SCALE: 1"= 60'	
CLIENT NAME:	MARKHAM DEVEL. MGMT. GROUP, INC.	PLATE:	2 of 3

LOG #: BGR

CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE
Contractor					
Inspector					
Date Completed					

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ELEVATION = 1094.817

SCALE
Horizontal: AS SHOWN
Vertical: N/A

SEAL: REGISTERED PROFESSIONAL ENGINEER — LARRY R. MARKHAM No. 30657 Exp. 3-31-06 CIVIL — STATE OF CALIFORNIA

Designed By	Drawn By	Checked By
CAG	CAG	BWL

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L. R. MARKHAM R.C.E. No. 30657 Date Expires: 3-31-06

Recommended By: Date:

Accepted By: Date:

R.C.E. No. Expires:

COUNTY OF RIVERSIDE DEPARTMENT OF BUILDING & SAFETY

ROUGH GRADING & EROSION CONTROL PLANS
FOR:
P.U.P. NO. 778

Date: 1/5/06

GR-

Sheet 3 of 8

JN 1280

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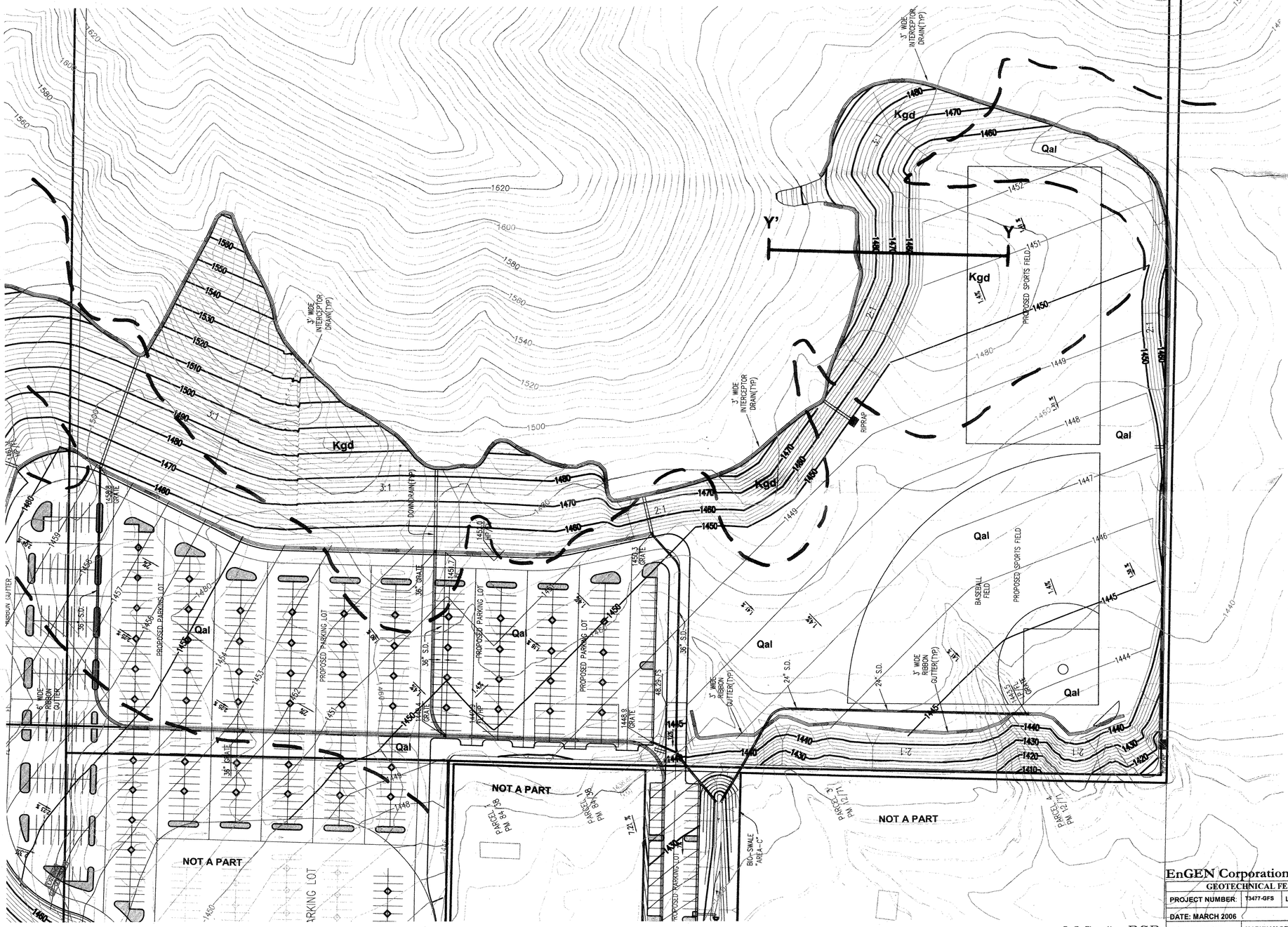
ROUGH GRADING PLANS
P.U.P. NO. 778



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GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

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EnGEN Corporation

GEOTECHNICAL FEASIBILITY STUDY SITE PLAN			
PROJECT NUMBER: T3477-GFS	LEGAL DESCRIPTION:	APN 367-210-018 and 367-140-008	
DATE: MARCH 2006	SCALE: 1"= 60'		
CLIENT NAME: MARKHAM DEVEL. MGMT. GROUP, INC.	PLATE:	3 of 3	

LOG #: BGR

CONSTRUCTION RECORD	DATE	BY	REVISIONS	ACC'D	DATE
Contractor					
Inspector					
Date Completed					

BENCHMARK R-S
ALUMINUM DISC IN CONCRETE POST APPROX. 0.45 MILES N.W.'LY FROM THE POST OFFICE AT MURRIETA, CA. N.E. OF THE TEE INTERSECTION OF KALMIA ST. AND 2nd AVE., 31 FEET N.E.'LY OF THE CENTERLINE ON 2nd AVE., 31 FEET S.E.'LY OF CENTERLINE OF KALMIA ST., 56 FEET S.E.'LY OF PP NO. 1594267E, 2 FEET N.W.'LY OF END OF BLOCK WALL, 5 FEET N.E.'LY OF A 4"x4" STREET SIGN POST. RESET 1983
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SCALE
Horizontal: AS SHOWN
Vertical: N/A

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Designed By	Drawn By	Checked By
CAG	CAG	BWL

These Plans Were Prepared Under The Supervision Of:
Date
L. R. MARKHAM R.C.E. No. 30657 Expires: 3-31-06

Recommended By: Date:
Accepted By: Date:
R.C.E. No. Expires:

COUNTY OF RIVERSIDE DEPARTMENT OF BUILDING & SAFETY

ROUGH GRADING & EROSION CONTROL PLANS
FOR:
P.U.P. NO. 778

Date: 1/5/06
GR-
Sheet 4 of 8

JN 1280

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