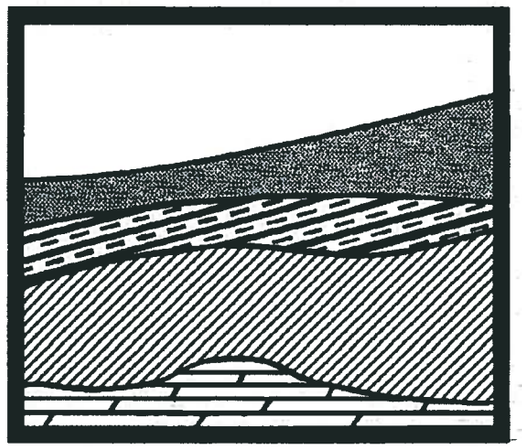
Apéndice X. Estudio Suelos y Geología



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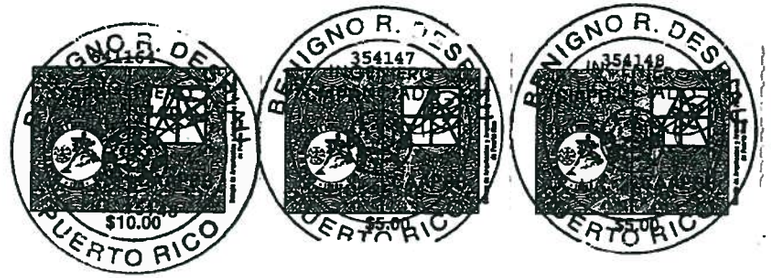

REPORT
PRELIMINARY SUBSURFACE EXPLORATION
RESIDENTIAL DEVELOPMENT AND EARTHWORK
ENGINEERING ASSESSMENT
FOR THE PROPOSED BOSQUES DE CIDRA DEVELOPMENT
AT State Road PR-172, KM. 10.3
BAYAMÓN WARD, CIDRA, PUERTO RICO
REFERENCE DA/06O3037

SAN JUAN, PUERTO RICO
NOVEMBER 28, 2006

Despiau Associates
Consulting Geotechnical Engineers

November 28, 2006

Mr. Rafael Cruz Pérez, P.E., Environmental Engineer
San Francisco Urb.
153 Violeta St.
San Juan, Puerto Rico 00927
Tel. (787) 767-4542; Cell. (787) 553-6598; Fax: 787-282-7193

Reference: Subsoil Exploration and Geotechnical Services for the Proposed Bosques de Cidra Development Complex at State Road PR-172, Km. 10.3 at Bayamón Ward at the Municipality of Cidra, Puerto Rico. Reference: DA/06O3037

Dear Mr. Cruz Pérez:

As requested, we have performed the subsoil exploration for Residential Development and Earthwork Assessment at the Proposed Bosques de Cidra Urbanization at an approximate 250 Cdas. Tract of Land at State Road PR-172, Km. 10.3 (Interior) at Bayamón Ward, at the Municipality of Cidra, Puerto Rico.

The technical aspects of the work were made with the collaboration of Mr. Rafael Cruz Pérez - Consulting Engineer. The work is made with the approval by Bosques de Cidra, Inc., in accordance to the proposal No. 07-04-06, dated July 12, 2006 with Contract Sheet on September 29, 2006.

The present report covers the field testing program, to evaluate the occurrence of underground crevices or sinkholes, within the karst topography, which may cause a roof collapse of the surface clay soils at the site. The field exploratory drilling, laboratory tests performed on secured soil samples, are presented in conjunction with the engineering analyses, with the summary of findings and earthwork assessments for the project.

Respectfully Submitted,

DESPIAU ASSOCIATES

Benigno R. Despiau, P. E., F.ASCE, F.NSPE
Consulting Geotechnical Engineer

csr

Enclosures

P.O. Box 11562 Santurce Station, San Juan, P.R. 00910-2662 * Tel. (787) 281-0686 * Fax (787) 764-4709

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DA

I. INTRODUCTION

This preliminary report presents the results of the Geotechnical Exploration for Residential Development and Earthwork Assessment at the Proposed Bosques de Cidra Development Complex at an approximate 250 Cdas. Tract of Land at State Road PR-172, Km. 10.3 (Interior) at Bayamón Ward, at the Municipality of Cidra, Puerto Rico.

The technical aspects of the work were made with the collaboration of Mr. Rafael Cruz Pérez - Consulting Engineer. The work is made with the approval by Bosques de Cidra, Inc., in accordance to the proposal No. 07-04-06, dated July 12, 2006 with Contract Sheet on September 29, 2006.

The present report covers the field testing program to evaluate the subsurface conditions through test borings and test pits at pre selected locations throughout the tract of land to identify the soil and rock units, excavation difficulties and general guidelines for soil improvements for the proposed Residential project at the site. The field exploratory drilling, laboratory tests performed on secured soil samples, are presented in conjunction with the engineering analyses, with the summary of findings and earthwork assessments for the project.

This report has been prepared for the exclusive use of Bosques de Cidra, Inc., and the A/E design firm in charge of the Proposed Residential Development and Retail Development at 28 Acres Tract of Land design and for the preparation of plans and specifications.

II. SITE AND PROJECT DESCRIPTION

The site is located to the south of at State Road PR-172, Km. 10.3 (Interior) at Bayamón Ward, at the Municipality of Cidra, Puerto Rico.

The most prominent topographical features are the Prieta Creek tributary to Cidra Lake. The lake borders the western and southern sectors of the farm. At the north sector of the farm two (2) existing topographical depression drain to De Las Quebradillas Creek, found at the northeastern sector of the farm. These gullies are tributaries to the Turabo River, which flow east of the farm. At the south sector, the Cidra Lake also borders the farm at the identified intermediate and southeastern land areas of the farm. The depressions areas were identified as the lowland sectors at the south-western sector of the site.

The existing topography at the site varies from approximately 400 m. to 440 m. The Enclosed is a portion of US Geological Survey Service Topographical plan at a scale 1:20,000, Figure 1.

DA

FROM US GEOLOGICAL SURVEY TOPOGRAPHIC MAP AT A SCALE 1:20,000

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SITE PLAN
PROPOSED BOSQUES DE CIDRA AT STATE ROAD PR-172, KM 10.3 (INTERIOR) AT BAYAMÓN WARD, CIDRA, PUERTO RICO.
REFERENCE: DA#603037

1

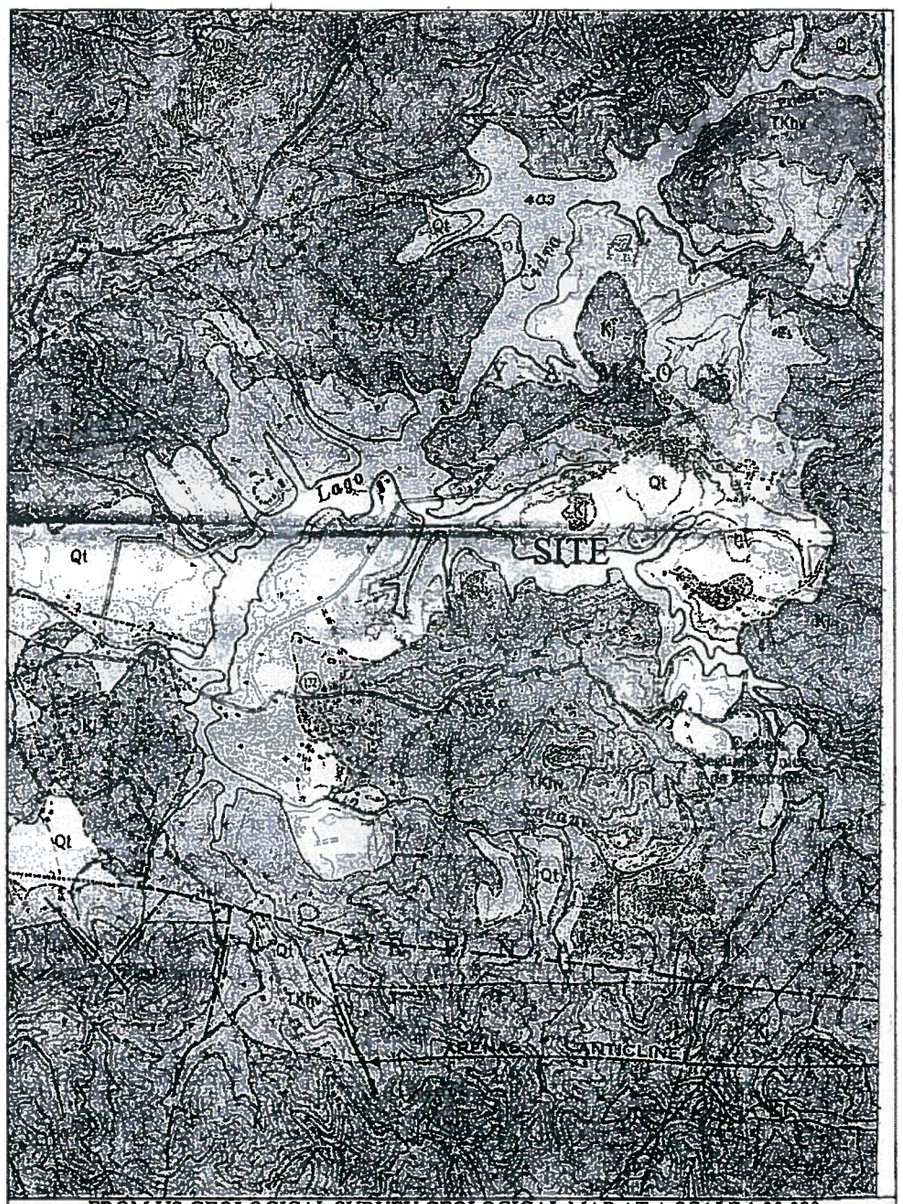
FROM US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE AT 1:20,000

Despiau Associates Corp.
SOIL/GEOTECHNICAL ENGINEERING LABORATORIES

SITE PLAN

PROPOSED BOSQUES DE CIDRA AT STATE ROAD PR-172,
KM 10.3 (INTERIOR) AT BAYAMÓN WARD,
CIDRA, PUERTO RICO.
REFERENCE: DA/0603037

1a



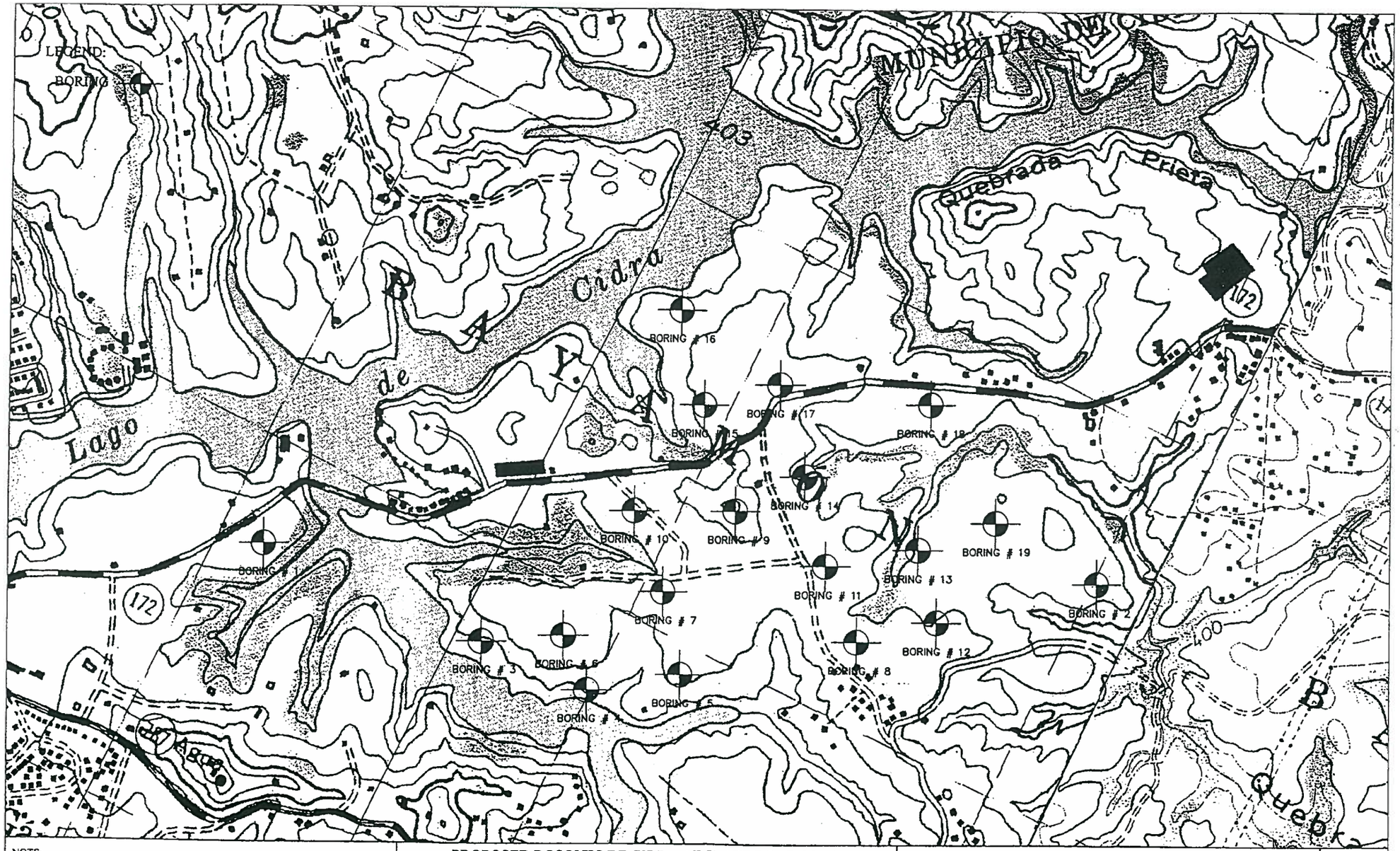
FROM US GEOLOGICAL SURVEY GEOLOGICAL MAP AT A SCALE 1:20,000

Despiau Associates Corp.
SOIL/GEOTECHNICAL ENGINEERING LABORATORIES

SITE PLAN

PROPOSED BOSQUES DE CIDRA AT STATE ROAD PR-172,
KM 10.3 (INTERIOR) AT BAYAMÓN WARD,
CIDRA, PUERTO RICO
REFERENCE: DA/0603037

1B



NOTE:
THIS BORING LOCATION PLAN WAS PREPARED USING THE US GEOLOGICAL SURVEY TOPOGRAPHIC MAP

SCALE:
RE-SCALE FROM ORIGINAL AT 1:20,000

PROPOSED BOSQUES DE CIDRA AT STATE ROAD PR-172,
KM 10.3 (INTERIOR) AT BAYAMÓN WARD,
CIDRA, PUERTO RICO.
REFERENCE: DA/06O3037

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III. FIELD SUBSURFACE AND SAMPLING PROGRAM

3.1 Subsurface Investigations

The present test boring program was investigated via nineteen (19) standard penetration test borings covering most part of the tract of land. Bulk samples were secured from test pits performed adjacent to selected boring locations. The location of the borings is shown in the accompanying Boring Location Plan.

Sampling of soils was performed continuously in the upper 7 ft. and thereafter, at approximately five foot intervals. All soil samples were taken with a 2"-O.D. split barrel sampler following the standard penetration test procedures in ASTM D-1586. Penetration resistance from the standard penetration tests are recorded in the "N" column of the boring logs.

The procedures used for the laboratory tests, as well as the routine and special laboratory procedures used, for the determination of the index soil properties are contained in the Appendix (1) to this report.

3.2 Surface Soils and Geological Units

3.2.1 Surface Soils

Based on the Soils Conservation Service Manual of the San Juan Area prepared by Rafael A. Boccheciamp and others, the soil series identified at the tract of land are as follows:

A. At Valleys and Upland Sectors of Development

1. Aceitunas Clay, 5 to 12 % slopes (AaC) – These soils have been described as well drained soil on terraces and alluvial fans, exhibiting a smooth sloping grounds. Typically, the surface layer is dark brown friable clay, about 8-inches thick. The subsoil, to depth of 60 inches, is yellowish red clay, formed in residuum from basic volcanic rocks. It is firm to a depth of 30-inches and is friable from 30- to 60-inches in depth. Its permeability and available water capacity are moderate. Runoff is medium and has a deep root zone. It has been identified to posses a low shrink/swell potential and a high risk to corrosion to uncoated steel and concrete. Its permeability is in the range of 0.6 to 2.0 inches / hr.

2. Daguey clay, 12 to 20 percent slopes (DaD) – These soils are found in moderately steep terrain and are well drained on stable side slopes, ridge tops and foot slopes of the humid volcanic uplands. Typically, the surface layer is brown, firm clay about 10-inches thick. The subsoil consists of yellowish red and red firm clay, about 62-inches thick. The substratum is yellowish red, friable silty clay loam saprolite mottled with strong brown and reddish yellow formed in residuum from basic volcanic rocks. Its permeability and available water capacity are moderate. Runoff is medium and has a deep root zone. It has been identified to posses a moderate shrink/swell potential and a high risk to corrosion to uncoated steel and concrete. Its permeability is in the range of 0.6 to 2.0 inches / hr.

B. At Lowland Sector, Gulley and Streams Sectors of Development

3. Humatas clay, 20 to 40 percent slopes (HtE) – This is a steep, well drained soil on side slopes and ridge tops of strongly dissected humid uplands. Typically, the surface layer is dark brown, friable clay about 5-inches thick. The subsoil is red friable clay and yellowish red, friable silty clay, about 29-iches thick. The substratum is red dark red, yellowish red, strong brown and olive yellow friable silty clay saprolite formed in residuum from basic volcanic rocks. Its permeability and available water capacity are moderate. Runoff is rapid and erosion is a hazard. Slippage is common in road banks, ditches and drainage ways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to layout, establish and maintain. This soil has been identified to be limited to urban uses because it is steep and subject to landslides. The root zone is deep. It has been identified to posses a moderate shrink/swell potential and a high risk to corrosion to uncoated steel and concrete. Its permeability is in the range of 0.6 to 2.0 inches / hr.

3. Humatas clay, 40 to 60 percent slopes (HtF) – This is very steep, well drained soil on side slopes and ridge tops of the strongly dissected humid uplands. Typically, the surface layer is dark brown, friable clay about 5-inches thick. The subsoil is red friable clay and yellowish red, friable silty clay, about 29-iches thick. The substratum is red, dark red, yellowish red, strong brown and olive yellow friable silty clay saprolite formed in residuum from basic volcanic rocks. Its permeability and available water capacity are moderate. Runoff is rapid and erosion is a hazard. Slippage is common in road banks, ditches and drainage ways. This soil is difficult to work because it is steep and because of the stickiness and plasticity of the clay. Hillside ditches and diversions are difficult to layout, establish and maintain. This soil has been identified to be limited to urban uses because it is steep and subject to landslides. The root zone is deep. It has been identified to posses a moderate shrink/swell potential and a high risk to corrosion to uncoated steel and concrete. Its permeability is in the range of 0.6 to 2.0 inches / hr.

3.2.2 Geological Notes

The units that outcrop at and in the vicinity of the site, as shown in the US Geological Survey Maps I-320 and I1152, respectively of the Comerio and Caguas Quadrangles prepared by Maurice H. Pease, Jr. and Reginald P. Briggs (1960) and Cleaves L. Rogers (1979) are as follows:

1. Terrace deposits and Fanglomerate (QT) - Described as unconsolidated to weakly consolidated clay, including large cobbles and boulders of volcanic rock. These are adjacent to upland areas and the deposits grade into marginal fan, slope wash, and minor landslide deposits. Locally, include stream-channel deposits.

2. Formation, J (Kj) - Described as principally massive volcanic breccia and lava flows. Contain layers of poorly stratified tuff and volcanic conglomerate; fine grained bedded rock occurs locally. South of Quebrada De Las Quebradillas, the unit is predominantly volcanic breccia, inter layered with massive to poorly stratified tuff, with a few thin lava flows, and scarce siltstone and sandstone.

3. Hydrothermally Altered Metamorphic Rock (TKhv) – Described as light-gray clayey rock mottled when weathered by shades of red, brown, and grayish purple; locally highly siliceous and well-indurated.

An approximate alignment of the Río Arroyata Fault is found is found to the south of the site at about 4,000 ft. from the southernmost boundary limit of the farm. Its location has been labeled to be approximate and doubtful when concealed. The fault has shown relative movements west of the city limits of Cidra.

3.3 Stratigraphic Units

Considering the topographical configuration of the farm the stratigraphic units found, the summary of index properties and description are given below.

A. At Valleys and Upland Sectors of Development

The agriculturally modified surface fill layers were described as dark brown, brown, yellow, red, brownish yellow, reddish brown and olive yellow silty clay, with few to many roots. The samples in the upper section extend to depth 1.5 to 5.0 ft. in depth. The upper soil layers are prominently described as medium to stiff clay layers. The standard resistance to penetration (N-values) varies from 7 to 24 blows/foot. The natural moisture content varies from 31 to 47 percent.

The surface layer was followed by identified terrace and alluvial fan deposits and extends to an average depth of 7.5 ft. These were described as reddish brown, red, yellowish brown, yellowish red, reddish yellow, olive brown, and yellow mottled silty clay. The standard resistance to penetration (N-values) varied from 9 to 38 blows/foot. The natural moisture content varies from 28 to 44 percent. The prominently clay soils were found with a stiff to hard State of Consistency.

At the deeper levels the above described layers, it was found the residual or weakly consolidated clay material from the volcanic breccia and lava flows, which was described as mostly red, brown, reddish brown, yellow, olive yellow and mottled white, occasionally with black in joints of the blocky structure. The consolidated material was described as sandy clayey silt, sandy silt and sandy silt with weathered rock fragments. The Standard Resistance to Penetration (N-values) varied from 12 to 42 blows/foot. The natural moisture content was found between 17 and 51 percent.

B. At Lowland Sector, Gulley and Near Streams Sectors of Development

The surface layers were described as dark brown, brown olive yellow, reddish yellow and yellow red dark brown, brown, yellow, red, brownish yellow, reddish brown and olive yellow silty clay, and sandy silt, with few to many roots. The samples in the upper section usually extend to depths varying from 3.0 to 5.0 ft. in depth. The upper agriculturally modified layers extend deeper at some locations [Borings 1, 3 and 6]. The standard resistance to penetration (N-values) varies from 6 to 24 blows/foot. The natural moisture content varies from 19 to 84 percent.

The surface layer was followed by identified terrace and alluvial fan deposits and extends to depth varying from 7.0 to 13 ft. These were described as brown, yellow red, reddish brown and olive brown, with occasional mottles yellow clayey silt and silty clay, with traces of sand. The standard resistance to penetration (N-values) varied from 26 to 34 blows/foot. The natural moisture content varies from 25 to 36 percent. The prominently clay soils were found with a stiff to very stiff State of Consistency.

At the deeper levels the above described layers, it was found the residual or weakly consolidated clay material from the volcanic breccia and lava flows, which was described as mostly brown, weak red, yellow red, yellow, light olive brown and brown with black in joints of the blocky structure. The consolidated material was described as sandy silt, sandy clayey silt, and clayey sandy silt. The Standard Resistance to Penetration (N-values) varied from 10 to 73 blows/foot. The natural moisture content was found between 22 and 53 percent.

The graphical representation of the soil profiles are found in the boring logs included as Appendix (1) to this report.

3.4 Groundwater Levels

In the present borings of exploration groundwater levels generally were not found within the extent of depth drilled in the present exploration. At the location of Borings No. 1, 13 and 19, ground water was recorded deeper then 30.0 ft.

It is logical to expect surface runoff from the higher sectors flowing through the gullies toward the lowland sectors. All the ground water depths were established after the boring were completed and were measured from the existing ground surface prevailing during the period of the field work.

IV. PRELIMINARY ENGINEERING RECOMMENDATIONS

4.1 General Foundation Construction Guidelines

This preliminary subsoil exploration disclosed a prominently Terrace deposits and Fanglomerate consisting of friable clay material overlying the residuum derived from volcanic breccia and lava flows, as identified in the geological plan of the sector. Sound rock was not found to the depth at which the boreholes were bottomed. The owner shall be aware that an additional complementary Geotechnical exploration shall be performed on the final location of the proposed units of development. Based of the present preliminary exploration the underlying soils at the tract of land are capable to sustain the loads of the proposed the proposed Single Family Dwelling Units of the project. Such exploration shall include borings arranged throughout the Single Family Dwelling areas to assess the final parameters of foundation design and the pertinent recommendations to be used for the final design of the proposed structures of the project.

4.2 Residential Development Assessments

A series of classifications were done pursuant to establish the adequacy of surface cut material for use and borrow fill material for construction. On the samples obtained during the exploration, the samples were classified using the AASHTO and Unified classification system. The results obtained from the laboratory test show classification test values of the surface soil material as

fair to poor material for borrow source for soil-aggregate mixture for *Highway Construction Purposes* and generally the material from the deeper explored profile sections is also identified as fair to poor material for General Earth fill Engineering Sections.

Refer to Appendix 3, where a Summary of the Classification of Soils for Engineering Purposes (Unified Classification System) and ASSHTO Classification of Soils for Highway Construction is provided.

4.3 Preliminary General Earthwork and Site Improvement Recommendations

4.3.1 General Foundation Construction Guidelines

The underlying soils at the tract of land are capable to sustain the loads of the proposed *One- and Two-story Units*. The solum of the site has been described and thick agriculturally modified loamy surface clay layers with a moderate to high shrink-swell potential. It is followed by residual material of low shrink-swell potential. Except for the large cobbles and boulders of volcanic rock as described in the geological plan, the drilled sections are mostly rippable with standard heavy equipment equipped with rippers. These soils formed in residual material weathered from volcanic rocks. These soils are generally found on side slopes and rounded hilltops of the volcanic hills throughout the higher sectors of the tract of land. At deeper levels of the highland sector, the weathered material becomes hard rock where conventional ripping is limited.

4.3.2 Fill Embankment Stabilization at Lowland Sectors

As part of the site construction, at the initial stage of construction, it is necessary to pre treat the existing soils. The following construction stages shall be considered for these sectors of construction:

1. Once the surface unsuitable material (surface vegetative cover) and any remnant of organic soils, bark and tree residue refuse, which may be found close to the banks of the gullies and previously agriculturally modified filled sectors is removed, the permanent fill layers shall be deposited in stages.

2. A uniform thickness beneath the footprint of the structure shall be provided. In any case, the difference in the total fill thickness beneath any structural unit, as established by the structural designer, shall not exceed 1.0 m.

3. The earth fill material above the existing groundwater level shall be of A-2-4 or better AASHTO type. A-1-a fill type or crushed-stone material is recommended to be deposited at the flood susceptible zones near the gullies and streams.

4. Benching is required for all embankments placed on or against a slope steeper than 8:1. The existing slope has to be scalped first. This applies on all embankment areas whether the existing embankment cross slope is in the transverse or the longitudinal direction.

5. Slope embankment section subjected to stream scour, if any, shall be also protected with a rip rap facing with suitable erosion protection fabrics. The protective cover shall be placed

to a minimum elevation of 1.5 m. above the maximum flood level, as a storm water shed hydrologic analysis may establish.

4.3.3 Geotechnical and Foundation Design

Alternate scheduling construction schemes would have to be developed, considering the delay stabilization program at the site, if the fill section exceeds 3.0 m. in thickness. Under the soil improvement scheme presented in the previous section to this report, the expected settlements can be tolerated by the proposed *One- and Two-story Units* of development, provided the control of the engineering earth fill construction process is made in accordance to specifications.

At the selected site, the structures may be founded over the proposed fill section. Obviously, following the removal of any loose or soft organic clay soils or old loose fill section, were the maximum depth of over excavation of unsuitable material is predicted. Also, a uniform fill section is required, for which the expected fill section may increase even more. This is to assure the differential settlements are maintained within tolerable limits for the structural dwelling units.

A uniform fill section is required after removal of the surface loose fill soil material. The preliminary design of the foundations of the structures shall consider an allowable soil bearing pressure for fill sectors of 2.5 K/sq.-ft. at standard foundation depths of 2.0 ft., measured from final grade to be established. At cut sectors, over the residual soil material or weathered rock, the allowable bearing value of 3.0 k/sq.-ft. at a minimum depth of 2.0 ft. below the final grade. The final parameters of foundation design shall be established, once the final geotechnical investigation is performed upon completion of the Residential Development operation and preliminary earthwork at the site.

4.3.4 Special Settlement Considerations

Under the shallow footing type, it shall be considered in the design differential settlement, between the central and extreme sectors of the unit. The estimated differential shall be provided upon performance of the final geotechnical investigation. Earth fill embankment slopes shall be constructed with the required engineering fill sections in the same fashion as for structures.

The most important aspects for construction at the site are that related to the fill embankment section beneath the structure. The uniform fill section and the removal of any surface plastic clay and unsuitable surface material would reduce the expected settlements at the site.

4.4 Required Soil Improvements

At the explored locations, an over-excavation is required, to remove the surface very loose silty clay material and organic sediments, disclosed in the investigation. At these sectors of the project, the over excavation or demucking process shall be required prior to the placement of the structure fill section.

Thus, at the areas of structures including slopes, pavements and developing areas, it is recommended the complete removal of the surface plastic clayey material and surface organic sediments encountered during the earthwork phase of the project. It shall involve the removal of material under the direct supervision of a representative from this office. At cut sectors as required by the grading scheme, a recompaction of the surface exposed layer or highly eroded surface section shall be performed. It is suggested that a higher sectors an over cutting to reach the foundation (Df) be done in advance and backfilling be done to establish the finished floor level at the structure and excavation sectors for storm sewers and sanitary sewer pipelines alignments. Thus, such back fill and new fill sections should be considered for final cost estimates.

At the toe of slopes, if any, where earthwork required rising the lands to higher sloping levels, the demucking phase constitute one of the most important efforts to provide stability of the proposed permanent slopes at the site. The expected thickness of removal shall be established by a direct representative of this office.

4.4.1 Considerations for Fill Construction

The earth fill material for structures and slopes shall consist of a granular AASHTO A-2-4 or better type compacted to not less than 95 percent of its laboratory Modified Proctor Compaction Density.

At the location of the structures, the improvement of the surface material is mandatory. These shall be improved to the satisfaction of the inspecting Soils Engineer or approved representative.

The ground floor slab of the structures shall be casted over a well engineered fill material, following the standard specifications for fill construction, contained in Appendix II to this report.

It is necessary to remove any remnant of organic soils, bark, tree residue refuse and any top soil material containing overly saturated plastic clay root matter, at lowland gully sectors and streams, if any. After the surface top soil material is removed, under the direct supervision of a representative from this office, the engineered fill can be placed in 6-inch lifts. Any surface unsuitable overly saturated plastic clay material, if any, shall be removed prior to the deposition of the new properly engineered structural fill.

4.4.2 Groundwater Considerations

Some dewatering is expected during the foundation excavations and earthwork within the clay material, where ponds of water are normal. Particularly, during periods of intensive rains, some dewatering should be expected in the excavation phase of construction resulting from surface runoff. Any groundwater flows must be intercepted and carried to adequate drainage units outside the One- and Two-story Units areas.

At the site, moderate to high precipitation is expected. Therefore, dewatering and drainage problems should be carefully planned in advanced, to assure proper temporary stability of excavations during construction.

During construction, care should be taken to drain rain water to proper outfalls. All surface run-off water shall be collected and drained away from the structures and from slopes surfaces. Internal structure drains are not recommended.

4.4.3 Special Considerations for Fill Construction

As previously indicated, at some sectors of the project the surface loose material present problems associated very loose silty clayey soils and organic materials below existing grade. It is for such reason, it is recommended to remove the surface very loose material and organic section, to cast foundations at shallow levels over a well engineered fill section. The earthwork required under such circumstances involves the cutting of existing material beneath the existing surface clay material found at the explored locations. After the surface undesirable material is removed, under the direct supervision of a representative from this office, the engineered fill can be placed in 6-inch lifts.

Of particular importance is the pre construction phase, prior to the deposition of any fill at the site. The following fill construction guidelines shall be incorporated in the plans and specification for fill construction.

1. All fill slopes shall be constructed at a maximum slope ratio of 2H: 1V (Horizontal: Vertical). At cut sectors or where the very plastic clays susceptible to erosion and near gully or any stream, if any, the slope ratio shall be 2.25H: 1V. Benching is required for all embankments placed on or against a slope steeper than 8:1. The existing slope has to be scalped first. This applies on all embankment areas whether the existing embankment cross slope is in the transverse or the longitudinal direction. Refer to Appendix (2A).

2. The surface exposed material to stream forces shall be provided with stone armor adequately protected against stream currents as a hydrologic study may reveal. This criterion shall supersede any other standard specification related to slope construction.

3. At cut sectors, the slopes of the upper unconsolidated section shall be provided with a slope ratio of 2H: 1V (Horizontal: Vertical). The moderately weathered or residual material shall be provided with a maximum slope ratio of 1.75H: 1V (Horizontal: Vertical). Although not drilled in the present phase of exploration, permanent cuts into fresh rock can be provided with a 1.0H: 1.0V slope ratio. These materials were not drilled in the present boring program. Thus, verification of the exposed material by observation of a representative from this office shall be required, in order to assure slope stability of permanent slopes. The erosion potential and weathering of the exposed material prior to cutting shall be ascertained through actual field observations.

3. The fill shall be of an inorganic and non-swelling nature, having an A-2-4 or better AASHTO Classification. All borrow materials shall be taken to a soils laboratory for testing and approval prior to their use at the project. Refer to Appendix 3 for classification test results of samples from the surface layers of the site.

All fill material for pavement sectors shall also comply with AASHTO A-2-4 or better classification and shall be compacted in layers not to exceed 6 inches to not less than 95% of the Modified Proctor Density. The enclosed fill specifications (Appendix 2) detail our recommended Fill Specifications.

4.4.4 Earthwork Demucking Operations

At some locations, the surface loose and undesirable material shall be adequately removed during an initial demucking phase of construction which shall follow the general stripping of the vegetative cover.

Based on the present profile data, the demucking includes but not limited to the stripping of topsoil, and over excavation of wet over saturated clay soils sectors. The actual depth and horizontal extend of excavation shall be determined directly at the field by the inspecting Soils Engineer.

4.4.5 Excavations and Rippability Characteristics

For most parts of the project, shallow excavations not exceeding 4 to 5 ft. can be performed using back hoe equipped with a short tip radius and narrow bucket. Frequent occurrence of consolidated materials, and boulders and rock fragments within the fill section and upper alluvial profiles above the base of foundation elevations will increase both the time and cost of the operations.

It is estimated that for trench excavations, which are limited in dimensions, the use of back hoes shall be used for the excavations. These shall be equipped with special demolition tools to drill through the more consolidated portions in the profiles to attain the desired invert elevations of the pipes. The difficulties of excavations begin to be of consideration for materials exhibiting higher than 40 blows/foot of penetration. In this project, it is evident that such types of materials are found and they will be more evident after the general grading operations are done. Since maximum cuts to approximately up to 30 ft. are presently contemplated, the residual, weathered rock and highly weathered rock material from the volcanic lava rock shall be encountered. At most of the explored locations the material corresponds to completely weathered materials from the parent rock.

Experience dictate with similar materials, such as consolidated clays, and residuum of the weathered volcanic rock found much deeper. Sometimes it is required the use of systematic drilling and even the use of pave-breakers, to lower excavation through these very hard residual materials.

A careful review of the geological plans with the herein enclosed profile information would assist the planners in the selection of the adequate cutting equipment of the project. It should be noted that sound rock material was not drilled in the present test boring program. Gravely soils and weathered rock nuclei and outcrops of the partially weathered rock material may be found. The surface elevations of the completely weathered, residual or rock layer are predicted at some locations at the depth at which the borings were bottomed.

Additional seismic refraction survey shall be performed to establish and predict the required earth-moving equipment to excavate through the different geological formations and rock types, at each sector of the project. It is known that excavation in rock depends on the bedding planes (joint spacing and thickness of beds).

It is obvious that the surface completely weathered and alluvial soils found in the thin shallow levels are relatively easy to remove. The residual is relatively deep and due shallow cuts are predicted. However, residual and weathered rock or fragments of boulders, cobbles may be found. The field data contained in subsurface explorations through these materials tend to give a false impression that they can be easily removed with standard heavy equipment, as they are broken with the split spoon sampler device during sampling.

The necessity of alternate tandem ripping with demolition tools attached to the back hoe shall be considered as a required item in the earth-moving contract for the trench excavations. Actual fresh rock drilling was not required during the drilling operation, within the extent of depth drilled in the present exploration.

4.5 Storm Water Run-off Control

Whenever large topographic changes are made, groundwater flows are usually found, which can be detected during the grading process. Such conditions shall be observed and the flow diverted to proper outfall, through adequate drainage units.

To prevent underground degradation of the fills, it is necessary to provide adequate drains, consisting of crushed stone or clean gravel enclosed in filter fabrics to prevent clogging. The drains minimum cross section dimension shall be established based on the water shed analysis of the gully or stream being considered.

Drainage units of sufficient capacity shall be also provided. All surface water shall drain freely away from the embankment slope mass. The existing gullies shall be provided with coarse gravely materials to prevent erosion. Thus, French drains" shall be provided along existing gullies and embankments, to allow adequate drainage of subsurface flows once the gullies are filled. The "French Drains" shall be properly enclosed in non-woven filter fabrics.

4.6 Additional Recommendations

We urge that our firm be retained to review those portions of the plans and specifications that pertain to earthwork and foundations to determine whether they are consistent with our recommendations.

The recommended geotechnical design concepts must be complemented with a structural design, which include and is not limited to the preparation of plans and specifications. For such purposes we urge the structural designer to contact this office to clarify and review the designed process and to assist in the preparation of the specifications for the required work, to meet the geotechnical requirements herein being presented.

In addition, we are available to observe construction, particularly during earthwork and the pile installation process, and other field observations as may be necessary.

V. LIMITATIONS OF THIS REPORT

The above recommendations are based in the information and interpretation of laboratory data of an arbitrary number of test borings. Actual conditions, especially at intermediate locations, may differ from the information obtained in this exploration. The owner or contractor are urged to contact this office if different conditions than those herein described are encountered.

The recommendations contained in this report may have to be varied to accommodate recommendations to cope with undisclosed conditions. Furthermore, the monitoring and inspection of earthwork related construction procedures, as well as the supervision of the implementation of the herein given recommendations shall be made by the writer or his approved representative. Otherwise, the inspecting engineer shall study this report, perform additional tests as he deems necessary, to submit his own recommendations or assume full responsibility of the herein given recommendations in their entirety.

Respectfully Submitted,

DESPIAU ASSOCIATES

Benigno R. Despiau, P.E., F.ASCE, F.NSPE
Consulting Geotechnical Engineer

November 28, 2006
DA/06O3037

csr

Appendix (1) - Boring and Test Pit Logs
Appendix (2) - Earthwork Specifications
Appendix (2A) - Excavation and Earthwork Benching
Appendix (3) - Special Laboratory Tests

APPENDIX (1)

Boring and Test Pit Logs

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 1
SHEET: 1 of 2
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 11/22/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 60
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	2-5-8	13		***Clayey Silt*** Brown and red clayey silt, few roots.	78		21					
	SS	2	7-10-10	20		***Clayey Silt***	83		29	4.5				
	SS	3	10-14-15	29		Red and olive yellow clayey silt.	83		84			46.3	17.7	A-7-6 (15)
5	SS	4	9-13-16	29		***Clayey Silt***	83		28					
	SS	5	12-17-20	37		Red and light olive brown clayey silt.	83		33					
10	SS	6	10-13-17	30			89		25					
15	SS	7	11-14-18	30			83		36					
20	SS	8	10-13-15	28			89		31					
25	SS	9	6-7-10	17			89		33					
30	SS	10	10-13-15	28			78		31					
35	SS	11	9-14-18	32		***Sandy Clayey Silt*** Red, light olive brown, white mottled sandy clayey silt.	83		34					
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ↧ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ↧ Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 2
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/24/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 30
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	2-4-5	9		***Silty Clay*** Brown, yellow and red mottled silty clay, few roots.	78		26		Ground water level was not found			
	SS	2	4-5-5	10			83		40	2.5				
	SS	3	7-9-12	21		***Silty Clay*** Yellow and reddish yellow silty clay, few roots.	89		24	3.7				
5	SS	4	8-9-13	22			83		37	4.0		48.5	17.3	A-7-6 (19)
	SS	5	10-12-17	29		***Silty Clay*** Reddish brown and yellow mottled silty clay. ***Sandy Clayey Silt*** Red olive yellow and brown sandy clayey silt.	89		25					
10	SS	6	11-13-18	31			83		29					
15	SS	7	12-14-17	31			78		33					
20	SS	8	10-12-16	20		***Clayey Sandy Silt*** Red, brown and white mottled clayey sandy silt.	78		29					
25	SS	9	12-14-17	31			83		29					
30														
35														
40														
45														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ↧ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ↧ Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 3
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037
DATE: 11/16/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 40
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	2-4-8	12		*Silty Clay*	67		31					
	SS	2	3-6-7	13		Brown, red, yellowish red silty clay, some sand, few roots.	78		32	3.9				
	SS	3	6-7-7	14			83		34					
5	SS	4	6-8-8	16		*Clayey Silt*	89		27	3.7				
	SS	5	7-7-7	14		Brown yellow red, yellow mottled clayey silt, some sand few roots.	89		36					
	SS	6	8-12-14	26		*Sandy Clayey Silt*	78		48					
15	SS	7	8-11-17	28		Yellow, black in joints sandy clayey silt.	83		38					
20	SS	8	16-20-22	42		*Clayey Sandy Silt*	83		36					
	SS	9	17-21-24	45		Yellow, black in joints clayey sandy silt, trace weathered rock fragments, below 35ft.	78		41					
30	SS	10	15-19-23	42			83		35					
35	SS	11	17-24-27	51			78		32					
40														

Ground water level was not found

q_u (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ⊻ Depth of Water Before Completion
Wn = Natural Water Content in Percent of Dry Weight ⊻ Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 4
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037
DATE: 11/16/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 40
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	1-4-6	10		*Silty Clay*	94		22					
	SS	2	3-4-4	8			100		31					
	SS	3	4-5-8	13		Red, olive yellow and brown silty clay, few roots.	100		31	3.4				
5	SS	4	12-12-14	26			100		32	1.2		62	31	A-7-5 (38)
	SS	5	13-15-14	29		*Silty Clay* Red, olive yellow silty clay.	100		31	4.3				
10	SS	6	15-14-15	29		*Clayey Silt*	100		23					
15	SS	7	10-10-12	22		Reddish brown, yellow mottled clayey silt.	94		22					
20	SS	8	10-11-12	23			94		23					
25	SS	9	10-13-12	25			89		25					
30	SS	10	12-13-13	26		*Sandy Silt* Weak red, olive yellow sandy silt, trace clay.	94		25					
35	SS	11	11-13-13	26			94		25					
40														

Ground water level was not found

q_u (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ⊻ Depth of Water Before Completion
Wn = Natural Water Content in Percent of Dry Weight ⊻ Depth of Water After 24 Hours

Despiau Associates Corp.

Soil / Geotechnical Engineering Laboratories

BORING NO.: 5
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 11/9/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 20
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	3-6-6	12		*Clayey Silt* Dark brown clayey silt, few roots.	94		31					
	SS	2	2-6-6	14		*Silty Clay* Brown reddish yellow, black in joints silty clay, few roots.	100		30	3.4				
5	SS	3	8-10-10	20			100		28					
	SS	4	9-10-9	19		*Silty Clay* Yellowish red silty clay, some sand.	100		34					
	SS	5	5-6-6	14		*Clayey Silt* Reddish brown and yellow clayey silt.	100		38					
						Sandy Silt Yellow, red and white mottled sandy silt.								
10	SS	6	4-5-9	14		*Clayey Silt* Yellow, weak red, black in joints clayey silt.	100		53					
15	SS	7	8-9-10	19			100		48					
20														
25														
30														
35														
40														

Ground water level was not found

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler

Wn = Natural Water Content in Percent of Dry Weight

Depth of Water Before Completion

Depth of Water After 24 Hours

Despiau Associates Corp.

Soil / Geotechnical Engineering Laboratories

BORING NO.: 6
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/31/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 40
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	1-7-7	14		*Silty Clay* Red, brown and olive yellow silty clay, trace sand (fine), few roots.	83		37			50	15.8	A-7-5 (19)
	SS	2	4-8-8	16			83		34	3.7				
5	SS	3	7-9-12	21		*Clayey Silt* Reddish brown clayey silt, trace sand, few roots.	78		35	2.5				
	SS	4	8-10-13	23		*Clayey Silt* Reddish brown clayey silt.	89		36					
						Clayey Silt								
	SS	5	7-9-11	20			83		35					
10	SS	6	8-10-14	24		Red, brown and light olive brown clayey silt, trace sand.	78		32					
15	SS	7	8-11-15	26			78		38					
20	SS	8	10-13-17	30			78		37					
25	SS	9	9-12-16	28			89		37	2.5				
30	SS	10	8-11-14	25		*Silty Clay (R)* Red and light olive brown silty clay, trace sand.	78		35	1.9				
35	SS	11	8-12-15	27			83		34	2.2				
40														

Ground water level was not found

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler

Wn = Natural Water Content in Percent of Dry Weight

Depth of Water Before Completion

Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 7
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 11/10/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 30
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	2-6-3	6		***Sandy Clayey Silt*** Dark brown sandy clayey silt, many roots.	100		35		Ground water level was not found –			
	SS	2	3-5-3	8		***Silty Clay*** Reddish brown, black in joints silty clay, many roots.	100		33					
	SS	3	8-9-12	21		***Silty Clay*** Reddish brown silty clay, some sand.	100		28					
5	SS	4	15-11-11	22		***Clayey Silt*** Yellowish brown, yellow mottled clayey silt, some sand.	100		26					
	SS	5	4-5-5	10		***Clayey Sandy Silt*** Reddish brown, yellow mottled clayey sandy silt.	100		31					
10	SS	6	5-7-9	16		***Sandy Silt*** Yellowish red sandy silt.	100		31					
15	SS	7	7-9-11	20		***Sandy Silt*** Weak red, yellow and brown in joints sandy silt.	100		41					
20	SS	8	12-15-16	31			100		39					
25	SS	9	12-16-16	32			100		45					
30														
35														
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ↧ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ↧ Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 8
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/18/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 20
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	2-5-7	12		***Silty Clay*** Dark brown silty clay, many roots.	100		37		Ground water level was not found –			
	SS	2	2-7-9	16			100		34	2.8				
	SS	3	8-11-13	24		***Silty Clay*** Reddish brown silty clay.	100		31	3.5		50.3	17.5	A-7-5 (22)
5	SS	4	11-12-14	26		***Clayey Silt*** Reddish brown and olive yellow clayey silt.	100		31					
	SS	5	5-8-9	17		***Sandy Clayey Silt*** Red and olive yellow, black joints sandy clayey silt.	100		44					
10	SS	6	8-12-16	28			100		38					
15	SS	7	16-17-21	38			100		27					
20														
25														
30														
35														
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ↧ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ↧ Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 9
SHEET: 1 of 2
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 11/13/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 50
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
0						Ground Surface								
	SS	1	5-7-10	17		***Sandy Silt*** Weak red, yellowish brown and yellow sandy silt, trace subangular gravel fragments, few roots.	72		20		Ground water level was not found"			
	SS	2	7-9-11	20			78		19					
	SS	3	6-7-5	12		***Clayey Sandy Silt***	83		28					
5	SS	4	4-2-2	4		Weak red and brownish yellow clayey sandy silt.	83		28					
	SS	5	2-3-3	6		***Silty Clay***	6		31	0.4				
10	SS	6	3-3-3	6		Weak red olive yellow and white silty clay, trace sand.	83		32	0.3				
15	SS	7	2-3-3	6		***Silty Clay*** Weak red, brownish yellow and strong brown silty clay, trace sand.	78		32	0.3				
20	SS	8	1-2-2	4			67		31	0.2				
25	SS	9	1-1-4	5			39		30					
30	SS	10	3-4-4	8		***Clayey Sandy Silt*** Weak red and olive yellow clayey sandy silt.	89		33					
35	SS	11	3-4-5	9			83		36					
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 9
SHEET: 2 of 2
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 11/13/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 50
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
45						***Silty Clay*** Yellow and brown silty clay, some sand, trace weathered rock fragments.								
50														
55														
60														
65														
70														
75														
80														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 10
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

DATE: 11/15/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 40
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
0						Ground Surface								
	SS	1	2-5-8	13		***Silty Clay*** Brown to dark brown, reddish brown and black joint silty clay, trace sand few roots.	78		49					
	SS	2	4-7-9	16			78		44	2.7				
	SS	3	7-9-10	19		***Silty Clay*** Red, light gray mottled silty clay.	83		33	4.2				
5	SS	4	8-9-11	20			89		33	4.3		53	20.3	A-7-5,(24)
	SS	5	7-8-9	17			78		49	0.9				
10	SS	6	8-10-13	23		***Clayey Silt*** Yellow mottled, red mottled, yellowish red, yellow, browins yellow and black joints clayey silt.	78		45					
15	SS	7	8-11-14	25			89		52					
20	SS	8	7-10-13	23			83		53					
25	SS	9	9-13-17	30			78		45					
30	SS	10	15-23-30	53		***Clayey Silt (R)*** Yellow and black jonts clayey silt.	78		45					
35	SS	11	17-25-29	54					40					
40														

Ground water level was not found

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler

Wn = Natural Water Content in Percent of Dry Weight

Depth of Water Before Completion

Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 11
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

DATE: 10/11/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 20
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
0						Ground Surface								
	SS	1	3-7-8	15		***Silty Clay*** Dark brown silty clay, many roots.	78		47					
	SS	2	4-7-9	16			78		40	2.0				
	SS	3	9-12-7	19		***Silty Clay*** Strong brown silty clay, few roots.	83		36					
5	SS	4	7-7-8	15		***Clayey Silt*** Reddish yellow and yellow mottled clayey silt.	83		38					
	SS	5	5-6-7	13			89		44					
10	SS	6	5-6-6	12		***Clayey Silt*** Reddish yellow and white mottled black joints clayey silt.	89		45					
15	SS	7	6-6-6	12			83		48					
20														
25														
30														
35														
40														

Ground water level was not found

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler

Wn = Natural Water Content in Percent of Dry Weight

Depth of Water Before Completion

Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 12
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/17/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 20
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	2-5-5	10		***Silty Clay*** Brown silty clay, many roots.	100		32					
	SS	2	3-6-11	11		***Silty Clay*** Light red and brown joints silty clay, few roots.	100		40					
	SS	3	7-12-16	28			100		35					
5	SS	4	11-12-13	25		***Silty Clay*** Red and olive yellow silty clay.	100		40			62	28.6	A-7-5 (31)
	SS	5	10-16-14	30		***Sandy Clayey Silt*** Red and olive yellow mottled black joints sandy clayey silt.	100		41		Ground water level was not found			
10	SS	6	8-10-11	21			100		37					
15	SS	7	7-8-9	17			100		38					
20														
25														
30														
35														
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler.
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 13
SHEET: 1 of 2
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/20/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 50
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	1-4-3	7		***Silty Clay*** Red and yellow silty clay, few roots.	100		40					
	SS	2	3-5-4	9		***Silty Clay*** Yellowish red and olive yellow silty clay.	100		41	2.3				
	SS	3	7-9-10	19			100		34	3.0				
5	SS	4	8-10-11	21			100		38	3.2				
10	SS	5	8-10-10	20		***Clayey Silt*** Red and olive yellow mottled clayey silt.	94		41					
	SS	6	8-9-10	19			94		40					
15	SS	7	6-7-8	15			100		46					
20	SS	8	6-7-9	16		***Clayey Silt (R)*** Weak red, yellow mottled brown in joints clayey silt, trace sand.	94		46					
25	SS	9	7-8-9	17			100		49					
30	SS	10	7-9-11	20			89		51					
35	SS	11	8-10-12	22			83		48					
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
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BORING NO.: 13
SHEET: 2 of 2
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/20/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 50
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
	SS	12	6-7-9	16		*Continued* Weak red, yellow mottled brown in joints clayey silt, trace sand.	78		49					
45	SS	13	8-10-10	20		*Clayey Silt* Red and yellow clayey silt.	83		50					
50														
55														
60														
65														
70														
75														
80														

Qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
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BORING NO.: 14
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/25/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 40
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
0						Ground Surface					Ground water level was not found			
	SS	1	2-6-7	13		*Silty Clay* Dark brown sady silty clay, many roots.	94		39					
	SS	2	1-7-7	14		*Silty Clay* Dark brown to brown silty clay, few roots.	100		38	3.0				
5	SS	3	8-10-14	24		*Silty Clay* Reddish brown silty clay, trace fine sand.	100		29	4.5		53	19.7	A-7-5 (22)
	SS	4	13-12-12	24			100		28	4.4				
	SS	5	4-5-7	12		*Sandy Silt* Reddish brown sandy silt, trace clay.	100		25					
10	SS	6	5-6-7	13			100		30					
15	SS	7	12-15-21	36		*Silty Clay (R)* Red and olive yellow silty clay	100		28	4.2				
20	SS	8	18-20-22	42			100		28	4.5				
25	SS	9	9-11-13	24		*Sandy Silty Clay (R)* Reddish brown sandy silty clay.	72		29					
30	SS	10	14-16-16	32		*Clayey Silt (R)* Red, yellow, black joints clayey silt.	72		55					
35	SS	11	13-13-14	27			78		52					
40														

Qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

BORING NO.: 15
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 11/7/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 30
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	1-5-3	8		*Silty Clay* Dark brown silty clay, many roots.	100		45		Ground water level was not found			
	SS	2	5-5-7	12		*Silty Clay* Brown and brownish yellow silty clay, few roots.	100		43	2.3				
	SS	3	6-11-14	25			100		35	4.2				
5	SS	4	12-19-19	38		*Silty Clay* Strong brown, yellowish brown and black in joints silty clay, with black concretions.	100		31	5.0				
	SS	5	6-9-13	22		*Clayey Sandy Silt (R)*	100		37					
10	SS	6	10-12-13	25		Weak red, yellow and black in joints clayey sandy silt.	100		39					
15	SS	7	10-13-13	26			100		34					
20	SS	8	12-14-14	28			100		37					
25	SS	9	11-13-13	26			100		37					
30														
35														
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ↧ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ↧ Depth of Water After 24 Hours

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BORING NO.: 16
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 11/8/2006
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 40
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	2-4-3	7		*Silty Clay* Reddish brown, red and yellow silty clay, few roots.	100		32		Ground water level was not found	49.5	18	A-7-5 (21)
	SS	2	3-11-12	23			100		34	3.6				
	SS	3	12-17-20	37		*Silty Clay* Red, yellow mottled silty clay.	100		29					
5	SS	4	13-15-18	33			100		34	3.5				
	SS	5	12-14-16	30			100		28					
10	SS	6	9-14-18	32		*Sandy Silt* Weak red, yellow, white mottled sandy silt.	89		27					
15	SS	7	10-12-13	25			94		36					
20	SS	8	10-11-12	23			100		35					
25	SS	9	14-16-17	33		*Sandy Silt (R)* Weak red, yellow, white mottled sandy silt, trace clay, trace weathered rock fragments.	94		34					
30	SS	10	13-16-16	32			94		17					
35	SS	11	17-18-21	39			89		21					
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ↧ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ↧ Depth of Water After 24 Hours

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BORING NO.: 17
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/18/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 20
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	3-5-8	14		**Silty Clay** Dark brown silty clay, many roots.	72		34		Ground water level was not found			
	SS	2	4-6-9	15		**Silty Clay** Red and brown silty clay, few roots.	78		41	2.7				
	SS	3	6-7-8	15			83		34	2.7				
5	SS	4	7-8-9	17		**Silty Clay** Red silty clay.	78		35	3.0				
	SS	5	6-8-8	16			89		39					
10	SS	6	10-12-14	26		**Sandy Clayey Silt (R)** Red, yellow mottled brown mottled, black in joints sandy clayey silt, trace sand.	78		43					
15	SS	7	11-13-15	28			78		43					
20														
25														
30														
35														
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
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BORING NO.: 18
SHEET: 1 of 1
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

DATE: 10/19/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 40
DRILL MACHINE: Mot. Cathead
DRILLER: R. Bruno
DRILL METHOD: Wash Boring

CASING: 2-1/2" O.D. SAMPLER: SS
Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30
Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	1-5-6	11		**Silty Clay** Brown silty clay, many roots.	100		39		Ground water level was not found			
	SS	2	3-6-8	14		**Silty Clay** Red and olive yellow silty clay, few roots.	100		33	3.5				
	SS	3	8-16-18	34		**Silty Clay** Red and olive yellow silty clay.	100		30	4.0		60	24.9	A-7-5 (30)
5	SS	4	21-17-20	37			100		33	4.2				
	SS	5	3-6-6	12		**Sandy Clayey Silt** Brown, yellow, white mottled, black in joints sandy clayey silt.	100		50					
10	SS	6	3-3-6	9			100		45					
15	SS	7	4-5-6	11			100		45					
20	SS	8	9-11-12	23		**Sandy Clayey Silt (R)** Yellow, brown, black in joints sandy clayey silt.	100		44					
25	SS	9	10-12-13	25			100		44					
30	SS	10	8-10-12	22			100		48					
35	SS	11	10-11-12	23			94		51					
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler
Wn = Natural Water Content in Percent of Dry Weight
Depth of Water Before Completion
Depth of Water After 24 Hours

Despiau Associates Corp.
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BORING NO.: 19
SHEET: 1 of 2
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

DATE: 10/21/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 45
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Ground Surface								
0	SS	1	3-5-7	12		*Silty Clay* Yellowish red and brown silty clay, few roots.	67		28					
	SS	2	3-5-6	12			78		36	3.4				
	SS	3	10-12-14	26		*Silty Clay* Red, yellow and black joints silty clay, few roots.	83		42	2.2				
5	SS	4	9-11-14	25		*Silty Clay* Yellow, olive yellow and red silty clay.	83		34	4.0				
	SS	5	12-15-17	32		*Silty Clay* Yellow, olive yellow and red silty clay, few roots.	78		36	4.5				
10														
15	SS	6	13-18-18	34			83		33					
						Clayey Silt (R)								
20	SS	7	15-17-20	37			78		35					
	SS	8	7-9-11	20		Red, yellow and light olive brown clayey silt, trace sand.	89		46					
25														
30	SS	9	8-10-12	22			89		42					
	SS	10	9-11-12	23			83		44		▼			
35														
	SS	12	8-9-13	22			78		40					
40														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ▼ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ▼ Depth of Water After 24 Hours

Despiau Associates Corp.
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BORING NO.: 19
SHEET: 2 of 2
LOCATION: Cidra
NORTHING: N/A
EASTING: N/A

PROJECT: Bosques de Cidra, Inc. REFERENCE NO.: DA/06O3037

CASING: 2-1/2" O.D. SAMPLER: SS

Hammer Weight (lb.): 300 Drop (in.): N/A Hammer Weight (lb.): 140 Drop (in.): 30

Type : N/A Size : N/A Type: Split Spoon Size: 1-3/8" I.D.

DATE: 10/21/06
GROUND ELEV.: N/A
DEPTH OF HOLE (ft.): 45
DRILL MACHINE: Mot. Cathead
DRILLER: J. Rosario
DRILL METHOD: Wash Boring

Depth (ft)	Sampler	Sample No.	Blows/6 in	SPT N-Value	Symbol	Material Description	% Recovery	R.Q.D.	Water Content (%)	qu	Water Level	Liquid Limit	Plasticity Index	Soil Classification
						Continued								
	SS	11	10-13-15	28		Red, yellow and light olive brown clayey silt, trace sand.	78		46					
45														
50														
55														
60														
65														
70														
75														
80														

qu (TSF) - Unconfined Compression Strength wh = Weight of Hammer to Drive Sampler ▼ Depth of Water Before Completion

Wn = Natural Water Content in Percent of Dry Weight ▼ Depth of Water After 24 Hours

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PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP - 2
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: J. Rosario
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 11/22/2006 DATE ENDED: 11/23/2006

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
0						Ground Surface	
	1	-	-	-		**Clayey Silt** Brown to dark brown clayey silt, few roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

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PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP - 4
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: R. Bruno
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 11/16/2006 DATE ENDED: 11/16/2006

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
0						Ground Surface	
	1	-	-	-		**Clayey Silt** Brown and reddish brown clayey silt, many roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

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PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP 6
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: J. Rosario
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 10/31/06 DATE ENDED: 10/31/06

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
0						Ground Surface	
	1	-	-	-		Silty Clay Reddish brown silty clay, many roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

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PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP - 8
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: R. Bruno
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 10/18/2006 DATE ENDED: 10/18/2006

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
0						Ground Surface	
	1	-	-	-		Clayey Silt Brown clayey silt, many roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

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PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP - 10
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: J. Rosario
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 11/15/2006 DATE ENDED: 11/15/2006

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
						Ground Surface	
0	1	-	-	-		Clayey Silt Brown to dark brown clayey silt, many roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP - 14
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: R. Bruno
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 10/25/2006 DATE ENDED: 10/25/2006

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
						Ground Surface	
0	1	-	-	-		Clayey Silt Brown clayey silt, many roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

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Soil / Geotechnical Engineering Laboratories

PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP-16
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: J. Rosario
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 11/8/2006 DATE ENDED: 11/8/2006

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
0						Ground Surface	
	1	-	-	-		Silty Clay Red and brown silty clay, many roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

PROJECT NAME: Bosques de Cidra, Inc. TEST PIT NO.: TP - 18
LOCATION: Cidra SHEET: 1 of 1
NORTHING: N/A EASTING: N/A ELEVATION: N/A
EQUPMENT: Pick and Shovel for Open Test Pit
LOGGER: R. Bruno
PIT DIMENSIONS: LENGTH: 1 ft. WIDTH: 1 ft. DEPTH: 2 ft.
WATER LEVEL DEPTH: -
DATE STARTED: 10/19/2006 DATE ENDED: 10/19/2006

DEPTH (FT.)	SAMPLE NO.	POCKET	CLASSIFICATION	WATER CONTENT	SYMBOLS	MATERIAL DESCRIPTION	REMARKS
0						Ground Surface	
	1	-	-	-		Clayey Silt Brown clayey silt, many roots.	
2							
4							
6							
8							
10							

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS TEST PIT LOCATION AND SHOWN DEPTHS.

ROUTINE LABORATORY TEST PROCEDURES

The subsurface exploration and testing program was directed toward the determination of problems, such as the presence of incompetent soils and a high groundwater table. In addition, the allowable bearing pressure of the soils and the foundation level is determined.

1. Classification

Visual-manual procedures, in accordance with ASTM D-2488, were employed to identify the subsoils at the site. Soils are described as one of the following: boulders, gravel, sand, silt, clay, organic soils and peat. Differentiation between the coarser soils is made by visual appreciation of predominant grain size. Fine grained soils (silt, clay, organic soils and peat) are partly identified using plasticity or dilatancy characteristics and the dry strength of the soil instead of the grain size.

2. Moisture Contents

The moisture content was determined for all samples obtained, and it is expressed in percentage of the given ratio of the weight of water and a given soil mass to the dry solid particles in it. The procedure used were in accordance to ASTM Designation D-2216.

3. Atterberg Limits

Designations: D-423 an D-424 establish respectively the standards for the determination of the liquid and plastic limits of the collected clayey samples. They are expressed as water contents and define the boundaries of three states in terms of "limits" as follows: (a) "liquid limit", the boundary between the liquid and the plastic states, and (b) "plastic limit", the boundary between the plastic and semi-solid states.

4. Volume Changes

Swelling characteristics are obtained in order to permit the expeditious identification of foundation soils which could be potentially troublesome due to excessive volume changes as shrinkage and swelling. The ratio of sample volume to its dry volume is recorded while immerse in distilled water for a period of 24 hours.

5. Unconfined Compressive Strengths (q-u)

A measure of shear strength was obtained for all cohesive soils sampled, where possible. The shear strength was determined either using a calibrated penetrometer, the unconfined compressive strength tester or the spring.

DESCRIPTIVE TERMINOLOGY CONSISTENCY OF COHESIVE SOILS AND RELATIVE DENSITY OF GRANULAR SOILS

To approximate the consistency of fine grained soils (soft, medium, stiff, very stiff, hard), a simple test is performed with the hand: a hard fine grain soil is difficult to indent with the thumbnail, a very stiff soil can be indented by the thumbnail, stiff soils are readily indented with the thumb, medium soils can be penetrated by moderate thumb pressure, soft soils are easily penetrated with the thumb, and soft soils run between the fingers when squeezed.

The consistency of cohesive soils has also been correlated to the results of the Standard Penetration Test, as shown below. The correlation, however, is greatly affected by the clay structures and factors as sensitivity.

TABLE 1 - DESCRIPTION OF SOIL DENSITY AND CONSISTENCY
COARSE GRAINED SOILS

Range of Standard Penetration Resistance (BPF)	Relative Density
0 - 4	Very loose
4 - 10	Loose
10 - 30	Medium
30 - 50	Dense
over 50	Very Dense

TABLE 2 - FINE GRAINED SOIL

Range of Standard Penetration Resistance (BPF)	Unconfined Compressive Strength (TSF)	Consistency
0 - 2	0 - 0.25	very soft
2 - 4	0.25 - 0.50	soft
4 - 8	0.50 - 1.00	medium
8 - 15	1.00 - 2.00	stiff
15 - 30	2.00 - 4.00	very stiff
over 30	over 4.00	hard

These are very approximate correlations which vary with, among other factors, overburden pressure, depth to water and grain size. These correlations are meaningless in soils with a significant amount of gravel or cobbles.

APPENDIX (2)

Earthwork Specifications

SPECIFICATIONS FOR PREPARATION EXCAVATION, FILLING AND GRADING

1. CLEARING AND GRUBBING

All trees and brush, including large roots, within the contract limit lines shall be cleared by the Contractor and suitably disposed.

2. STRIPPING

Topsoil shall be stripped from the site in all areas of excavation or fill. Topsoil shall be removed to its entire depth, and stockpiled in areas designated, or removed from the site.

3. COMPACTION OF SUBGRADE

Following stripping, the sub grade in all fill areas shall be compacted sufficiently to develop to a depth of at least twelve (12) inches at least 90% of modified Proctor maximum density as determined in the laboratory in conformance with ASTM designation D-1557.

4. MATERIAL FOR FILL

Material for fill shall be approved by the Soils Engineer. The criteria for acceptance shall be based on tests made for liquid and plastic limits, sieve analysis, maximum density at optimum moisture, shearing strength, and expansive qualities. Potential volume change tests shall accompany field density test results as required by field conditions. The fill material shall be AASHTO Classification A-2-4 or better for general earthwork construction. It shall be free of stone or rock fragments larger than 4-inch in their greatest dimension. All fill material shall be of an inorganic and non-swelling nature.

5. PLACEMENT AND COMPACTION OF FILL MATERIAL

Prior to placing fill, the sub grade shall be graded to provide adequate drainage, and shall be compacted as outlined in section 3.

(a) Placement of Fill:

The fill shall be spread evenly, in approximately horizontal layers of six (6) to twelve (12) inches loose thickness to be determined in the field by the Engineer.

(b) Moisture Control:

At the time of compaction, the material in each layer of fill shall have moisture content within 2% of optimum moisture content for compaction, as determined by ASTM D-1557 for determining the moisture-density relationship of the fill material.

(c) Drainage of the Site:

At all times the Contractor shall maintain and operate proper and adequate surface and subsurface drainage methods to the satisfaction of the Engineer in order to keep the construction site dry.

(d) Compaction Equipment:

It is the responsibility of the Contractor to select, furnish and properly maintain equipment which will compact the fill uniformly to the required density, however, the Contractor's selection of equipment is subject to approval by the Engineer. No fill shall be placed until approved compaction equipment is on the site and working condition.

(e) Compaction of Fill:

Each lift within load-bearing areas shall be uniformly compacted to at least 95% of modified Proctor maximum density as determined in the laboratory by the Engineer in accordance with ASTM designation D-1557 and each lift within non-load-bearing areas shall be uniformly compacted to at least 90% of the modified Proctor maximum density, unless otherwise required in the geotechnical report. Any lift, or portion there of which is not compacted in accordance with the specifications, shall be compacted or removed and replaced to the satisfaction of the Engineer. The degree of compaction of each lift shall be checked by the Engineer and each successive lift shall not be placed or compacted until the previous lift is inspected, tested and approved by the Engineer.

(f) Ground Slopes:

Existing ground slope surfaces, to be covered by the fill, steeper than 5.1 (horizontal: vertical) shall be scarified into steps or benches and the fill progresses in order to provide a bond and avoid any shear failure along the fill/natural ground interface.

(g) Slopes on Fill:

Slopes shall not be steeper than 2.0 to 1.0 (Horizontal to Vertical units). Drainage other than storm water falling directly to slope shall not be permitted to cut across slope areas. Protection of slopes by planting of grass and shrubs on the same shall be performed immediately upon their completion. Special sloping requirement may be established in the geotechnical report.

(h) Erosion Protection:

Embankment fills with slopes steeper than 1.5:1 (H: V) shall be protected from runoff and erosion by an appropriate type of vegetation cover. This may be performed by hydro mulching in such a way as to cover the soil as fast as possible until evidence of "catch" or uniform stand to prevent erosion is achieved, at which time final acceptance will be given. The Contractor shall properly water, mow, and otherwise maintain all treated areas until final acceptance.

6. SLOPE CONTROL PLANTING

This item shall consist of the preparation of slopes for planting, fertilizing the soils, sowing the soil-fixing grasses, and permitting adequate growth of planted seeds.

(a) PREPARATION OF GROUND:

The top soil surface shall be uniformly trimmed and raked to true lines until it is free from unsightly variations such as humps, ridges, or depressions. All objectionable materials which might interfere with sowing of seeds, growth of grasses or subsequent maintenance of grass-covered areas, shall be removed or cleared.

Storm water run-off shall not be carried over the slopes. In cut sections, adequate protection must be provided by means of paved diversion ditches.

(b) FERTILIZERS:

Accepted fertilizers shall be thoroughly dissolved into the soil to a depth of at least three (3) inches, in order to promote rapid growth of the grass.

(c) SOIL FIXING GRASSES:

The following types of grasses are recommended in their order of preference; however, any other type of local grass acceptable to the engineer may also be used; (a) Bermuda grass and (b) St. Augustine grass.

(d) MAINTENANCE:

The contractor shall mow, water and otherwise maintain all seeded areas until the building is occupied. Any area shall fail to catch will have to be re seeded. Surfaces where erosion gullies develop or otherwise become damage due to over saturation shall be repaired

7. BENCHING

When embankment is to be placed and compacted on hillsides or when new embankment is to be compacted against an existing embankment, or when an embankment is built one-half (1/2) width at a time, the slopes that are steeper than four to one (4:1) when measured at right angles to the roadway shall be continuously benched over these areas as the work is brought up in layers. Benching shall be of sufficient width to permit operation if placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts.

BD/sc

DA-06 revision

APPENDIX (2-A)

Specifications for Excavation and Earthwork Benching

Benching

Benching is required for all embankments placed on or against a slope steeper than 8:1. The existing slope has to be scalped first. This applies on all embankment areas whether the existing embankment cross slope is in the transverse or the longitudinal direction.

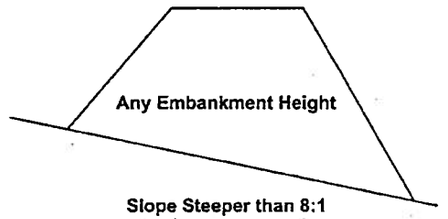


Figure 1 - Benching Required

Figure 2 details the bench into the existing embankment. For side hill fills, the existing embankment is physically notched out and connected to the new embankment. Benching requires horizontal cuts in the existing slope.

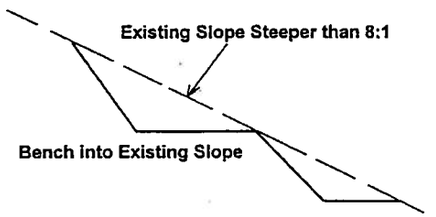


Figure 2 - Benching

The bench is wide enough to blend the new embankment with the existing embankment. In Figure 3, the total width between point A and B must be the width of the dozer blade and the compaction equipment.

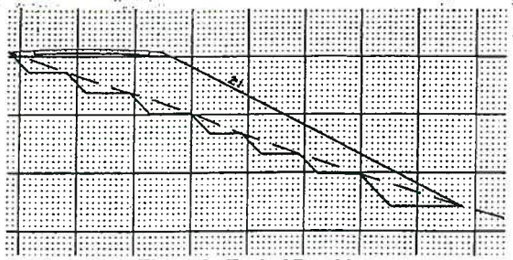


Figure 5 - Typical Benching

When the designer anticipates that there was a stability problem or weak soils in the existing embankment (or both). This is called special benching. Side hill embankments present unique problems in that they may be stable when originally constructed yet become unstable later. The result is usually a landslide.

If the bench is not benched into the existing embankment far enough then a weak plane can develop as shown in Figure 6. A failure may occur along this weak plane and the bench material will move laterally. The project should evaluate the existing soil conditions and determine if more benching is required than shown on the plans or required by the specifications.

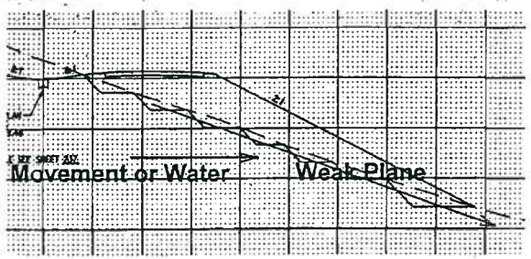
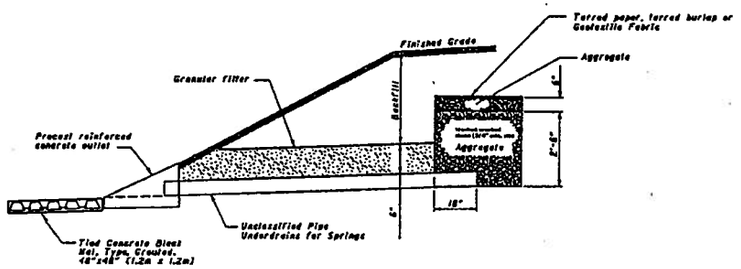


Figure 6 - Benching Problems

In most cases, the main cause of embankment benching failure is by water seeping into the embankment from the side hill or foundation. Notice in Figure 6 how water can move into the bench material and weaken the bench material.

Special attention must be given to side hill embankments. Consult the plans and soil profile to see where special benching, if any, is required; to see whether or not spring drains are provided, and to see if any potential spring or wet zones are mentioned. The areas should be inspected in detail for possible springs. In dry seasons, green or lush vegetation are often indicative of a semi-dormant spring that may become active during prolonged periods of precipitation. If spring zones are encountered and no spring drains are provided in the plans, then drains should be added to the work.

Spring drains are detailed on the plans by plan notes, when they have been ascertained during the design phase. The standard drawing for spring drainage is partially shown in figure 7. Use non-perforated pipe.



SECTION A-A

SPRING DRAIN DETAIL

Figure 7 - Spring Drains

See Figure 8 when more severe water problems are encountered. If the water is coming in at all elevations, then a filter fabric and coarse aggregate can be placed to take the water flows. The fabric is used to stop the migration of fines into the coarse aggregate.

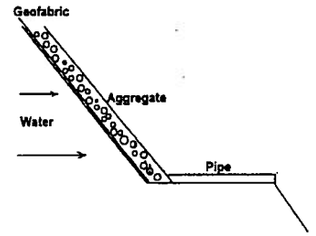


Figure 8 - Severe Water Problems in a Bench

APPENDIX (3)

Special Laboratory Tests

I. Laboratory Testing Procedures:

As may be required for the geotechnical evaluations, a series of non-routine or special tests could be performed to assist in the engineering analyses. The special tests performed are contained in separate sheets included in this Appendix. The special tests performed for the present project are included in the following list of laboratory tests, among other usually performed.

1. Vane Shear Test
2. Mechanical Analysis of Soils
3. Liquid & Plastic Limit Tests
4. Unit Weight Determination of Soils
5. Unconfined Compressive Strength Tests (Stress-Strain)
6. Compaction Tests
7. Free Swell Tests

A brief description of the tests procedures which are used in the above list of special tests is as follows:

1. Vane Shear Test

A pocket vane shear test device was used to perform various vane shear tests on samples (i.e SPT and Undisturbed Shelby Tubes). The results of the vane shear tests is given in tons per sq.-ft.

2. Mechanical Analysis of Soils

The process of separating the soil into particle-size groups, including both the sieve analysis of the coarser and fine grains was performed. Standard U.S. sieves were used to establish the Percent Finer by Weight of the samples. The percentage of fines was used to classify the samples in both the standard AASHTO and Unified Classification Systems.

3. Liquid & Plastic Limit Tests

The moisture content above which a soil readily becomes a liquid upon stirring is called the **liquid limit**. The standard Arthur Casagrande Device was use for such determination, following ASTM Specifications D423.

The **plastic limit** is defined as the minimum moisture content at which the soil mixture acts as a plastic solid. The standard ASTM specification D424 was followed in performing the tests.

From the above test results the **plasticity index** can be determined. It is defined as the numerical difference between the liquid limit and the plastic limit of the soil. In the data sheets the tests results given in the corresponding column are the Liquid Limit (LL) and the Plasticity Index (P.I.).

4. Unit Weight Determination of Soils

The wet unit weight of the samples was obtained by mass per unit volume from the sample, as secured from the field. Dry unit weight determinations were obtained and are specifically mentioned in some of the tables and graphs submitted.

5. Unconfined Compressive Strength Tests (Stress-Strain)

Basically the **unconfined** compressive strength test is performed by axially loading a cylinder without lateral confinement. In wet fine grained soils the tests are performed quickly. Different from the routine Qu tests, in the special unconfined compressive tests, which are performed in the triaxial compression chamber, the stress-strain at predetermined intervals are recorded. In the routine tests on SPT samples, the unconfined compression tests are performed by the spring tester. Sometimes, the pocket penetrometer device is used to determine the unconfined compressive strength. The test type is indicated in the corresponding column of test results.

6. Modified Proctor Compaction Tests

The **laboratory** compaction test consists of determining the maximum dry density and optimum moisture content of representative samples of potential borrow fill sources.

The Modified Proctor Density Tests are performed in accordance to the ASTM Designation D 1557, Standard Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using a 10-lb.Rammer and 18-in. drop.

7. Free Swell Tests

The free swell tests are made in accordance to the procedures of the US Bureau of Reclamation, which provide percent total volume change from dry to a saturated condition.

Despiau Associates Corp.
Soil / Geotechnical Engineering Laboratories

CLIENT:	Mr. Rafael Cruz Pérez, P.E.
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	San Juan, Puerto Rico 00927
PROJECT:	Bosques de Cidra
JOB NO.:	DA/06O3037
DATE:	November 20, 2006

SUMMARY OF SOIL CLASSIFICATION TESTS AND FREE SWELL TESTS

Boring No.	Sample Depth	Liquid Limit %	Plasticity Index %	% Passing US Sieve			Classification	% Free Swell	Clay Type Class.	
				10	40	200	AASHTO		AC*	CEAC**
1	3'-5'	46.3	17.7	99.9	94.6	79.1	A-7-6 (15)	20	0.22	0.36
2	5'-7'	46.5	17.3	100	97.8	91.8	A-7-6 (19)	25	0.19	0.31
4	5'-7'	62	31	100	99.8	99.3	A-7-5 (38)	30	0.31	0.56
6	1'-6"-3'	50	15.8	99.9	97.5	91.8	A-7-5 (19)	20	0.17	0.28
8	3'-5'	50.3	17.5	100	99.3	96.9	A-7-5 (22)	30	0.18	0.29
10	5'-7'	53	20.3	100	99.4	95.8	A-7-5 (24)	20	0.21	0.35
12	5'-7'	62	28.6	100	97.4	90.8	A-7-5 (31)	30	0.31	0.56
14	3'-6"-5'	53	19.7	100	98	90.5	A-7-5 (22)	25	0.22	0.36
16	1'-6"-3'	49.5	18	100	98.3	94.6	A-7-5 (21)	25	0.19	0.31
18	3'-5'	60	24.9	100	98.8	95.4	A-7-5 (30)	30	0.26	0.45

* Activity Ratio
** Cation Exchange Activity

P.O. Box 11562, Santurce Station, San Juan, P.R. 00910-2662 • Tel. (787) 281-0686 • Fax (787) 764-4709