Appendix D
Geotechnical Report – Black Eagle Consulting
PRELIMINARY GEOTECHNICAL INVESTIGATION

THE SOUTHERN PORTION OF THE BELLA VISTA RANCH
A Portion of Sections 3 and 10, Township 18N, Range 20E, M.D.M.

WASHOE COUNTY, NEVADA

AUGUST 2004

Prepared for:

Centex Homes

Black Eagle Consulting, Inc. - Geotechnical & Construction Services
Re: Preliminary Geotechnical Investigation
The Southern Portion of Bella Vista Ranch

Dear Mr. Waite:

Black Eagle Consulting, Inc. is transmitting herewith our preliminary geotechnical investigation of the southern portion of the Bella Vista Ranch in Washoe County, Nevada. A wide variety of materials are present, ranging from bedrock to coarse granular alluvial fan deposits, and complexly interbedded fine sand, silt, and clay flood plain deposits. Bedrock is present in limited areas in the higher elevations along the northeastern boundary. Coarse granular alluvial fan deposits are present east of Mira Loma Road. The remainder of the site west of Mira Loma Road in low-lying flood plain deposits is typified by complexly gradational and interbedded layers of fine sands, silts, and clays. The ground water table lies at shallow depths in several areas throughout the low-lying flood plain.

The enclosed report presents conclusions and recommendations for the planning and preliminary design of the project. If you require any clarification of our findings, please contact us. We look forward to being of continued service to Centex Homes on this project.

Sincerely,

Black Eagle Consulting, Inc.

Larry J. Johnson
President

Copies to: Addressee (5 copies)

cc: Mr. Randy Walters, MacKay & Somps
Ms. Peggy Bowker, P.E., Nimbus Engineers

LJJ:DH:nk
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PRELIMINARY GEOTECHNICAL INVESTIGATION

THE SOUTHERN PORTION
OF THE BELLA VISTA RANCH

(A Portion of Sections 3 and 10,
Township 18N, Range 20E, M.D.M.)

WASHOE COUNTY, NEVADA

INTRODUCTION

Presented herein are the results of the Black Eagle Consulting, Inc. preliminary geotechnical investigation and associated geotechnical recommendations for the southern portion of the Bella Vista Ranch, Washoe County, Nevada. These conclusions and recommendations are based on surface and subsurface conditions encountered in our research and exploration of the property. The objectives of this study were to:

1. Determine general soil, bedrock, and ground water conditions pertaining to planning, design, and construction of the proposed residential development.

2. Provide recommendations for due diligence, planning and preliminary design of the project, as related to these geotechnical conditions.

The area covered by this report is shown on Plate 1 - Plot Plan. Our investigation included field exploration, laboratory testing, and engineering analysis to determine the physical and mechanical properties of the various on-site materials. Results of our field exploration and testing programs are included in this report and form the basis for all conclusions and recommendations.
The services described above were conducted in accordance with the Black Eagle Consulting, Inc. proposal dated June 4, and revised July 6, 2004.

PROJECT DESCRIPTION

Project details are not available at this time, but planning studies are in progress. We anticipate that the site will be developed as residential housing projects with associated streets, utilities, and neighborhood parks.

SITE CONDITIONS

Access

This initial geotechnical investigation of the Bella Vista Ranch site covers approximately 585 acres in Sections 3 and 10, Township 18 North, 20 East, M.D.M. and includes most of the area south of the A & K conveyor belt, east of Alexander Lake and Steamboat Creek, and west of the Power substation and Mira Loma Road (refer to Plate 1a). The Bella Vista Ranch site is accessed by turning south along Alexander Lane, locally known as the Mira Loma Access Road, off of South McCarran Boulevard. A locked gate on the south side of Alexander Lane that accesses the north-central part of the site is present approximately 3.2 miles from McCarran Boulevard.

Topography and Vegetation

Topography ranges from a low of 4,425 feet in elevation near the valley floor to a maximum of 4,960 feet in the northwestern corner and 4,820 feet in elevation in the southeastern corner of the site. The majority of the site lies at or near valley floor elevations. Gradients across the valley floor are typically in the range of 0.5 to 1.0 percent.

Vegetation in the valley floor is dominated by green and brown grass that ranges from 6 inches to 5 feet in height. The hills and alluvial fans show sparse to moderate amounts of small sagebrush up to 3 feet tall. Wetland areas consist of abundant native green plants and weeds. Vegetation is larger and more abundant in areas adjacent to Steamboat Creek, Alexander Lake, and the other local irrigation ditches.
Lakes, Wetlands, and Irrigation Ditches

The majority of the property is flat and undeveloped and has been used previously for cattle ranching. Steamboat Creek crosses the western part of the site and is oriented in a north-south direction. Limited access across the area is provided by a small number of unimproved roads that traverse the ranch, with the primary road running north-south and directly east of Steamboat Creek. Areas of the eastern side of the ranch are inaccessible without a 2- to 3-foot deep water crossing. A number of east-west barbed-wire fences also cross the site. Alexander Lake covers approximately 41 acres and lies just outside of the area of study, near the northwestern corner of the property. Several wetlands are present on the southern part of the site. The largest wetland is located in the southeastern corner of the parcel and covers approximately 20 acres.

Throughout the ranch are several irrigation ditches that connect to Steamboat Creek, Alexander Lake, or several of the wetland areas. These ditches also serve as the local drainage features on the site. Sheet flow is also an important drainage pattern that is related to the topographic variation due to localized rises and depressions.

Gravel Operations

The most prominent activity on the Bella Vista Ranch site is the active mining of aggregate and gravel along the northeastern margin by A&K Earthmovers. Several other previously mined quarries are present outside the boundaries. The Alexander Lane roadway is heavily used by trucks hauling aggregate and gravel from the main Bella Vista Pit located on the northeast corner of the site and from Pit #2, located on the northwest corner of the site (see Plate 1). A conveyor belt crosses the northern boundary of the Bella Vista Ranch site (see Plate 1) connecting the mining operations between the two pits. The northeastern quarry has been partially backfilled with considerable depths of construction debris and uncontrolled fill.

Utilities and Other Development

An overhead power line is present on the northern and eastern boundaries of the Bella Vista Ranch site. The power line approaches a large power substation that lies just outside the eastern-central boundary of the site (see Plate 1).

Sewage treatment ponds lie approximately 1.4 miles to the south of the southern boundary of the Bella Vista Ranch site. The Sage Hills Gun Club and Shooting Range lies near the southeast corner of the site.
Sewer lines are currently being constructed directly south of the wetlands at the southern border of the parcel in the developing Damonte Ranch area.

EXPLORATION

Exploration of the Bella Vista site was conducted from June 11 to 16, 2004, and included both test pits and borings. Twenty-one test pits were excavated with Case 580 Super L and Case 580K rubber-tired backhoes. The maximum depth of excavation was 14.3 feet in Test Pit # 6. Test pit locations are shown on Plate 1a.

Deeper soils were explored on June 15 and 16, 2004, with three test borings. Two borings were advanced using 6-inch-outside-diameter (O.D.), 3-½-inch-inside-diameter (I.D.), hollow stem augers and a truck-mounted CME 55 soils sampling drill rig. All three borings were for liquefaction analysis and utilized rotary mud drilling techniques. The maximum depth of exploration was 41-¼ feet below the existing ground surface in B-1. Several attempts were made to advance borings B-2 and B3 below 36.3 feet and 33.0 feet, respectively, but caving conditions prevented further progress. The locations of the test borings are shown on Plate 1a.

The native soils were sampled in-place every 2 to 5 feet by use of a standard, 2-inch O.D., split-spoon sampler driven by a standard 140-pound drive hammer with a 30-inch stroke. The number of blows to drive the sampler the final 12 inches of an 18-inch penetration (Standard Penetration Test - ASTM D 1586) into undisturbed soil is an indication of the density and consistency of the material. Pocket penetrometer testing was performed on various samples of fine-grained soils in order to evaluate unconfined compressive strength.

Due to the relatively small diameter of the samplers, the maximum particle size that could be obtained was approximately 1-½ inches. The final logs may not, therefore, adequately represent the actual quantity or presence of cobbles or boulders.

Test pit numbers TP-1, TP-2, TP-3, TP-5, and TP-6, along with Boring #B-01, are located north of the site boundary for this initial geotechnical investigation. Geotechnical information from these test pits and one boring are included in this report.

Ground water observation wells were installed in ten of the test pits (TP-2, 6, 9, 10, 14, 16, 17, 18, 19, and 20) and in two borings (B-2 and B-3). The observation wells consist either of 10-foot long and 3-inch-diameter or 2-½-inch-diameter polyvinyl chloride (PVC) pipe with slotted intervals or drilled holes throughout the length of the pipe. A 20-foot long PVC pipe was installed in boring
B-3. The ground water observation wells at boring sites B-2 and B-3 were installed in hollow-stem auger borings that were drilled 5 feet away from the respective mud-rotary boring. The depth to the ground water table from the existing surface was measured in all 12 monitoring wells on June 17, 2004 and varied from a low of 2.7 feet at TP-2 and TP-16, to a high of 9.2 feet in TP-6 and greater than 10 feet in TP-10 (Table 1). A map showing ground water depth zones is included as Plate 1.c.

One trench (TP-7) was excavated 60 linear feet across the trace of a mapped earthquake fault (Bonham and Bell, 1993) in order to verify the precise location of the fault trace on the surface. The fault was not observed in the trench; however, previous disturbance from the active mining operations may have covered exposures of this fault. The maximum depth of the fault trench at TP-7 was 4.1 feet. A prominent northwest-trending fault zone was previously mapped by the Nevada Bureau of Mines and Geology (Bonham and Bell, 1993) in the northeastern corner of the site directly within the main operating Bella Vista open pit. However, this prominent fault zone was not trenched during this phase of exploration due to previous mining operations that have disturbed the native surface, including over 20 feet of mine fill cover.

<table>
<thead>
<tr>
<th>TEST PIT NUMBER</th>
<th>Depth to GWT from surface (ft.)</th>
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<tbody>
<tr>
<td>TP-02</td>
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</tr>
<tr>
<td>TP-06</td>
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<tr>
<td>TP-09</td>
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<td>TP-10</td>
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<td>TP-14</td>
<td>6.5</td>
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<td>6.2</td>
</tr>
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<td>B-02</td>
<td>6.9</td>
</tr>
<tr>
<td>B-03</td>
<td>4.6</td>
</tr>
</tbody>
</table>

GWT = Ground Water Table

Material Classification

Two members of the geotechnical staff examined and classified all soils in the field in accordance with ASTM D 2488. During test pitting, representative bulk samples were placed in sealed plastic
bags and returned to our Reno, Nevada, laboratory for testing. Additional soil classification was subsequently performed in accordance with ASTM 2487 (Unified Soil Classification System [USCS]) upon completion of laboratory testing as described below in the Laboratory Testing section. Logs of the test pits are presented as Plate 2 – Boring/Test Pit Logs, and a USCS chart has been included as Plate 3 - Graphic Soils Classification Chart.

LABORATORY TESTING

All soils testing performed in the Black Eagle Consulting, Inc. soils laboratory is conducted in accordance with the standards and methodologies described in Volume 4.08 of the ASTM Standards.

Index Testing

Samples of significant soil types were analyzed to determine their in situ moisture content (ASTM D 2216), grain size distribution (ASTM D 422), and plasticity index (ASTM D 4318), and the results of these tests are shown on Plate 4 - Index Test Results. Results of these tests were used to classify the soils according to ASTM D 2487 and to verify the field logs, which were then updated as appropriate. Classification in this manner provides an indication of the soil's mechanical properties and can be correlated with published charts (Bowles, 1996; NAVFAC, 1982a and b) to evaluate bearing capacity, lateral earth pressures, and settlement potential.

Chemical Tests

Chemical testing was performed on five ground water samples obtained from the ground water observation wells installed at the site (TP-2, TP-16, TP-19, TP-20, and B-02). The samples were tested for total boron content in order to evaluate the potential to discharge site ground water into the nearby Steamboat Creek. Total boron in the five water samples range from 5.3 to 81 mg/l (ppm) with the highest boron present in TP-16 (81 ppm) located in the southeast corner of the site near an existing wet lands area.

Chemical testing was also performed on five soil samples from 0 to 5 feet below the surface (in test pits 3, 5, 9, 14, and 17). The soil samples were tested for soluble sulfate, soluble chloride, pH, resistivity, and total boron which will help for future planning of landscape constraints. Total boron in the five soil samples range from 25 to 140 mg/kg (ppm) with the highest boron present in TP-5 located near the northwest corner of the site.
All chemical testing was performed by Western Environmental Testing Laboratory (WET Lab) of Sparks, Nevada. The results of the chemical tests are shown on Plate 5.

GENERAL GEOLOGY AND SOIL CONDITIONS

The Bella Vista Ranch lies immediately west of the Virginia Range, which has been previously mapped by the Nevada Bureau of Mines and Geology (Bonham and Bell, 1993) as consisting of three main rock and soil units: (1) volcanic rocks of the Kate Peak Formation, (2) alluvial fan deposits of the Virginia Range, and (3) flood plain deposits of the Truckee River and Steamboat Creek.

The western part of the Virginia Range is dominated by volcanic and volcaniclastic rocks from the Kate Peak Formation which consists of flows, domes, lahars, pyroclastic flows, plugs and dikes with ages ranging from 12.4 to 16.9 Ma (Bonham and Bell, 1993). Exposures of the Kate Peak Formation are locally present on the northwest and eastern boundaries of the Bella Vista Ranch site. No test pits or borings were completed in this bedrock unit.

Alluvial fan deposits of the Virginia Range lie on the western flank of the Virginia Range in the Bella Vista Ranch site and consist of subangular to subrounded clasts of gray to dark gray andesite with varying proportions of white to red altered andesite clasts; poorly to moderately stratified; poorly to very poorly sorted. Subunits of the alluvial fan deposits include: (1) light brown to brown, muddy, sandy, pebble gravel; locally with cobble to boulder gravel; pebbly sand derived from reworking of older eolian sand deposits; (2) light brown to brown, muddy, sandy, cobble to boulder gravel; maximum boulder diameter > 1m; soils contain a well-developed argillic (Bt) horizon ranging from ½ to 1 m thick, locally underlain by a carbonate- silica-cemented duripan as much as 1 m thick; this unit forms a prominent terrace east of Steamboat Creek. The alluvial fan deposits at the Bella Vista Ranch site are generally exposed east of the Mira Loma Access road but locally cross over the road in the south-central part of the site. Three test pits tested the alluvial fan deposits: TP-7, TP-12, and TP-21.

The flood plain deposits of the Truckee River and Steamboat Creek generally lie west of the Mira Loma Access road. The floodplain deposits consist of gray, dark gray-brown, and light brown sand, and sandy mud; locally may contain interbeds of pebble-cobble fluvial gravel and peat. A C¹⁴ date of 2130±165 years was obtained on a peat bed directly north of the Steamboat quadrangle (Bell and Bonham, 1987). The majority of the test pits and all three of the borings were located in the floodplain deposits.
Soils encountered during our exploration generally agree with the previous mapping by the Nevada Bureau of Mines and Geology. All of the test pits and borings completed by Black Eagle Consulting except for TP-07, TP-12, and TP-21 were located in the flood plain. The flood plain deposits in the valley floor or the main ranching area consist of a thinly interbedded sequence of silty sand, lean clay, and lean clay with sand with lesser fat clay, silty clay, poorly graded sand, and poorly graded sand with clay. The fine-grained soils are described as slightly moist to wet, brown to dark brown to dark brownish black, soft to very hard, and have 50 to 84 percent low to high plastic fines. Granular soils are dominated by silty sand, clayey sand, and silt, clayey sand with lesser poorly graded sand, poorly graded sand with clay, and poorly graded sand with silt. These soils are described as light brown to brown to dark grayish green, slightly moist to wet, and loose to medium dense. The plasticity indices of granular and fine-grained soils, verified in our laboratory, range from non-plastic to 36.

Coarse-grained granular soils are also encountered within the flood plain deposits at depths greater than 28.0 feet in B-1, 23.5 feet in B-2, and 27.5 feet in B-3. These soils consist of poorly graded gravel with sand, poorly graded gravel, poorly graded sand with silt and gravel, and poorly graded gravel with silt and sand. The coarse-grained granular soils in the deeper parts of borings B-1, B-2, and B-3 are described as dark gray to dark greenish gray, wet, dense to very dense, locally unconsolidated, with less than 5 to 15 percent non-plastic fines. Subrounded to subangular gravel makes up 15 to 80 percent of the total soil mass.

Test pits TP-7, TP-12, and TP-21 encountered alluvial fan granular soil deposits located to the east of the flood plain deposits. These granular soil deposits consist of a near-surface unit one foot thick of dry to slightly moist silty sand with estimated 15-20 percent non-plastic fines. Gravel-bearing material is common at depth within test pits TP-7 and TP-12 which consists of poorly graded gravel with clay, poorly graded gravel with sand, poorly graded gravel with silt and sand, poorly graded sand with gravel, and poorly graded gravel (duripan). Gravel content varies from 15 to 85 percent of the total soil mass. This material is typically a very dense duripan with slight to strong calcium carbonate cement. The back hoe was unable to excavate the gravel-bearing material at depths greater than 4.1 feet in test-pit TP-7 and at depths greater than 6.5 feet in test pit TP-12.

The alluvial fan deposits encountered in Test Pit TP-21 were all granular with trace to minor gravel. Soils encountered in TP-21 consist of an interbedded sequence of silty sand, poorly graded sand with silt and gravel, poorly graded sand with silt, poorly graded sand, and poorly graded sand with gravel. This material is described as grayish brown to brown, dry to very moist, and loose to very dense with a non-plastic fines content ranging from less than 5 percent to 20 percent.
Flood Plains

The majority of the Bella Vista Ranch site that is located to the west of the Mira Loma Road has been identified by the Federal Emergency Management Agency (FEMA) as lying in a shaded Zone A, or within the limits of a 100-year flood with no associated base flood elevation determinations (FEMA, 1994). The northern part of Steamboat Creek, within the northern half of Section 3 T18N, R20E, has been identified by FEMA as lying in a shaded Zone AE, or within the limits of a 100-year flood also with no associated base flood elevation determinations (FEMA, 1994).

The area lying primarily to the east of the Mira Loma Road has been identified by FEMA as lying in unshaded Zone X, which is outside the 500-year flood plain. A small sliver zone near the northern part of Mira Loma Road in the northeast part of Section 3, T18N, R20E has been identified by FEMA as lying within shaded Zone X, or within the area of a 500-year flood and within an area of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood (FEMA, 1994).

GEOLOGIC HAZARDS

Seismicity

Much of the Western United States is a region of moderate to intense seismicity related to movement of the crustal masses (plate tectonics). By far, the most active regions, outside of Alaska, center around the San Andreas fault system of western California. Other seismically active areas include the Wasatch Front in Salt Lake City, Utah, which forms the eastern boundary of the Basin and Range physiographic province, and the eastern front of the Sierra Nevada Mountains, which is the western margin of the province. The Reno-Sparks area lies along the eastern base of the Sierra Nevada, within the western extreme of the Basin and Range. It must be recognized that there are probably few regions in the United States not underlain at some depth by older bedrock faults. Even areas within the interior of North America have a history of strong seismic activity.

The Truckee Meadows lies within Seismic Zone 3, an area with a potential for earthquake damage. Seismicity within the Reno-Sparks area is considered about average for the western Basin and Range Province (Ryall and Douglas, 1976). It is generally accepted that the maximum credible earthquake in this area would be in the range of magnitude 7 to 7.5 along the frontal fault system of the Eastern Sierra Nevada. The most active segment of this fault system in the Reno...
area is located at the base of the mountains near Thomas Creek, Whites Creek, and Mt. Rose Highway, some 5 miles west of the project.

Faults

No earthquake hazards map is available for the project area. The published geologic map (Bonham and Bell, 1993) shows several faults in the northeastern portion of the site in areas of the aggregate quarry. These faults are also shown on the Quaternary Fault Map of Nevada (Bell, 1984) as being Pleistocene in age. The criteria for evaluation of Quaternary earthquake faults have been developed and adopted by the State of Nevada Seismic Safety Council. These standards define active faults as those with evidence of displacement within the past 11,000 years (Holocene time). Those faults with evidence of displacement during Pleistocene time (11,000 to 2,000,000 years before present) are generally considered potentially active. Based on the geologic map, the faults on the project are considered potentially active. Potentially active is a rather alarming and unfortunate term in that it suggests a higher degree of risk than is justified in most cases. Recurrence intervals for Nevada earthquakes along faults that have been studied are estimated to be in the range of 6,000 to 18,000 years in western Nevada (Bell, 1984). The very active eastern boundary faults of the Sierra Nevada Mountains may have a shorter recurrence interval of 1,000 to 2,000 years. Many of the smaller faults may be the result of one-time events in response to movement along a better developed and more active fault system a considerable distance away.

One trench TP-7 was excavated 60 linear feet across a fault mapped by the Nevada Bureau of Mines and Geology (NMBG; Bonham and Bell, 1993). The trench was examined for evidence of faulting; however, no fault was observed. Soil profiles are included as Plate 2. Most of the surface expression of fault traces mapped by the NBMG has been destroyed by aggregate mining operations. Additional fault trenching should be performed during design-level investigations.

Ground Motion and Liquefaction

Because the eastern portion of site area is underlain by dense granular soils and bedrock, liquefaction potential is minimal due to the types of materials present. Only localized amplification of ground motion would be expected during an earthquake in these areas. Mapping by the U. S. Geological Survey (1996) indicates that there is a 10 percent probability that a bedrock ground acceleration of 0.3 to 0.4 will be exceeded in 50 years. Including the effects of any potential soil amplification, the peak ground acceleration expected for the design earthquake will be approximately 0.384g using methods recommended in the 2003 International Building Code (International Codes Council, 2003).
Liquefaction is a nearly complete loss of soil shear strength that can occur during a seismic event in saturated, loose to medium dense, poorly graded sands, cohesionless silts, and gravels. Liquefaction results from cyclic shear strains causing partial collapse of the soil matrix and development of excessive pore water pressure between the soil grains. Liquefaction will result in settlements shortly after the earthquake. Water and sand may be expelled to the surface, referred to as sand boils; these may cause minimal damage, except if building footings are located directly over a major sand boil. For sites with gentle or minimal slopes or with an adjacent slope, significant damage may potentially result from ground oscillation or lateral spreading. These horizontal deformations occur due to either the earthquake motions imparted to the surface soils or the driving force of the existing ground surface slope, which cause the surface soils to move with relatively little resistance from the underlying liquefied soils.

The area has some limited areas of liquefiable soils, based on the presence of relatively young, loose to medium dense, sandy soils with a very high water table. Field exploration performed as a part of this investigation involved two rotary mud borings to a depth of 40 feet (Borings B-02 and B-03). Exploration, laboratory testing, and analysis were performed in accordance with the Guidelines for Evaluating Liquefaction Hazards in Nevada (Truckee Meadows Geohazards Committee, 2003), ASTM D 6066, and Youd et al. (2001). The variation of soil consistency, penetration resistance, and liquefaction threshold with depth are shown on Plate 6 - Liquefaction Potential Versus Depth. The figure shows the corrected penetration resistance in blows per foot versus depth, versus the predicted liquefaction threshold for the design earthquake. The threshold shown on the figure is the penetration resistance below which liquefaction will occur; penetration values plotting to the left of the threshold lines indicate liquefaction. The results of the liquefaction analyses indicate that the majority of the site soils are too cohesive or sufficiently dense to be considered liquefiable; however, there are two layers (one between 15 feet and 17½ feet in Boring B-02, and the other between 25 and 27½ feet in Boring B-03) that could liquefy during the design ground motion. The calculated total settlement for each of these layers is only about ½ inch. It is unlikely that this minimal amount of settlement would ever reflect to the surface. Supporting calculations are contained in Appendix A - Liquefaction Analyses.

In Nevada, there is no specific policy which requires structures to be designed to resist liquefaction. Such designs tend to be very costly and are usually limited to those structures with a public safety function, such as fire and police facilities and hospitals or buildings with high occupancy, such as large commercial, retail, office and manufacturing facilities, schools, municipal or major governmental buildings. These types of structures present a significant potential for loss of life and/or are important enough, from a public safety standpoint, such that a design to minimize liquefaction may be warranted. The decision to mitigate or accept liquefaction
risk is a business decision that can only be made by the owner/developer. The decision requires analysis of up-front mitigation costs as compared to the potential for longer range repair costs and liability.

We recommend that, as the area is developed and uses of the area with specific structures are formulated, a geotechnical investigation be completed for each of these specific projects. These specific geotechnical investigations can then address the potential for liquefaction at that location and the need, if necessary, for a liquefaction analysis and design for liquefaction effects.

**Flood Plains**

The majority of the Bella Vista Ranch site that is located to the west of the Mira Loma Road has been identified by the Federal Emergency Management Agency (FEMA) as lying in a shaded Zone A, or within the limits of a 100-year flood with no associated base flood elevation determinations (FEMA, 1994). The northern part of Steamboat Creek within the northern half of Section 3, T18N, R 20E, has been identified by FEMA as lying in a shaded Zone AE, or within the limits of a 100-year flood also with no associated base flood elevation determinations (FEMA, 1994).

The area lying primarily to the east of the Mira Loma Road has been identified by FEMA as lying in unshaded Zone X, which is outside the 500-year flood plain. A small sliver zone near the northern part of Mira Loma Road in the northeast part of Section 3, T18N, R20E has been identified by FEMA as lying within shaded Zone X, or within the area of a 500-year flood and within an area of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood (FEMA, 1994).

**Other Geologic Hazards**

A high potential for dust generation is present if grading is performed in dry weather. No other geologic hazards were identified.

**DISCUSSION AND RECOMMENDATIONS**

**General Information**

A wide variety of materials are present, ranging from:
• Volcanic bedrock along the eastern margin

• Coarse granular alluvial fan deposits lying predominately east of Mira Loma Road

• Complexly interbedded fine grain silts, clays, and sands in the lowlands west of Mira Loma Road.

The area east of Mira Loma road will serve as a good source of structural fill throughout the project. The existing borrow pit in the northeast corner contains significant quantities of construction debris and uncontrolled fill. Structural improvements should be separated from the fine grain and clay soils by structural fill. Ground water is shallow in portions of the low-lying areas, as shown on Plate 1c.

The recommendations provided herein, and particularly under Site Preparation, Grading and Filling, Foundation Design, Site Drainage and Quality Control, are intended to minimize risks of structural distress related to consolidation or expansion of native soils and/or structural fills. These recommendations, along with proper design and construction of the structure and associated improvements, work together as a system to improve overall performance. If any aspect of this system is ignored or poorly implemented, the performance of the project will suffer. Sufficient quality control should be performed to verify that the recommendations presented in this report are followed.

Structural areas referred to in this report include all areas of buildings, concrete slabs, asphalt pavements, as well as pads for any minor structures. All compaction requirements presented in this report are relative to ASTM D 1557. For the purposes of this project:

• Fine-grained soils are defined as those with more than 40 percent by weight passing the number 200 sieve, and a plastic index lower than 15.

• Clay soils are defined as those with more than 30 percent passing the number 200 sieve, and a plastic index greater than 15.

• Granular soils are those not defined by the above criteria.

Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this investigation. When suspected hazardous substances are encountered during routine geotechnical investigations, they are noted in the exploration logs and immediately reported to the client. No such substances were revealed during our exploration. A Phase I
Environmental Assessment was performed on this site by Black Eagle Consulting, Inc. in August 2004.

The test pits were excavated by backhoe at the approximate locations shown on the site plan. Locations were determined in the field by approximate means. All test pits were backfilled upon completion of the field portion of our study. The backfill was compacted to the extent possible with the equipment on hand. However, the backfill was not compacted to the requirements presented herein under Grading and Filling. If structures, concrete flatwork, pavement, utilities or other improvements are to be located in the vicinity of any of the test pits, the backfill should be removed and recompacted in accordance with the requirements contained in the soils report. Failure to properly compact backfill could result in excessive settlement of improvements located over test pits.

It is common practice in Northern Nevada to place unsuitable soils, including expansive clays and oversize rock, in back, front, and side yard areas. If the developer elects this alternate, as opposed to exporting such materials and importing/placing structural fills in yard areas, we recommend disclosure be included in the sales agreement. The buyer should be made aware that homeowner-added improvements, such as patios or swimming pools, will require geotechnical analysis.

Seismic Design Criteria

All structures at Bella Vista should be designed for Seismic Zone 3. The City of Reno has adopted the 1997 Uniform Building Code (ICBO), but is planning to change to the 2003 International Building Code (ICC, 2003) in late 2004. The ICC requires a detailed soils evaluation to a depth of 100 feet to develop the appropriate soils criteria. However, the code states that a Type S_D soil profile may be used as a default value when the soil properties are not known in sufficient detail to determine the soil profile type. The Type S_D soil profile is for stiff soils with a shear velocity between 600 and 1,200 feet per second, or with an N (SPT) value between 15 and 50 or an undrained shear strength between 1,000 and 2,000 pounds per square foot (psf). Based on our experience and the geology at the area, it is our opinion that the default soils profile Type S_D is appropriate for alluvial fan materials and S_c for flood plain areas. With that assumption, the recommended seismic design criteria are as follow:
TABLE 2 - IBC 2003 SEISMIC DESIGN CRITERIA

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral Response at Short Periods, $S_s$, percent of gravity (IBC Figure 1615)</td>
<td>144</td>
</tr>
<tr>
<td>Spectral Response at 1-Second Period, $S_t$, percent of gravity (IBC Figure 1615)</td>
<td>49</td>
</tr>
<tr>
<td>Site Class (IBC Table 1615.1.1)</td>
<td>$S_D$</td>
</tr>
<tr>
<td>Site Coefficient $F_s$, decimal</td>
<td>1.0</td>
</tr>
<tr>
<td>Site Coefficient $F_v$, decimal</td>
<td>1.51</td>
</tr>
<tr>
<td>Site Adjusted Spectral Response at Short Periods, $S_{MS}$ (IBC Eqn 16-16)</td>
<td>144</td>
</tr>
<tr>
<td>Site Adjusted Spectral Response at Short Periods, $S_{MI}$ (IBC Eqn 16-17)</td>
<td>74</td>
</tr>
</tbody>
</table>

These parameters were derived for an earthquake with a magnitude of 7 to 7.5 occurring on the eastern Sierra frontal fault system, 8 kilometers west of the site.

**Site Preparation**

All vegetation should be stripped and grubbed from structural areas and removed from the site. A stripping depth of 0.2 to 0.3 feet is anticipated.

Clay and fine grain soils were found to exist in various locations in various depths and thicknesses in the low-lying portions of the site. Laboratory testing performed on these materials indicates the clay soils exhibit plasticity indices on the order of 16 to 26, indicative of moderately expansive soils (Nelson and Miller, 1992).

Surficial clay soils on this site will exhibit considerable shrink-swell with changes in moisture content. Such soils are common, but sporadically distributed and must be identified during grading. Failure to recognize and properly mitigate expansive clays will result in damage to improvements. Clay soils should be separated from improvements by structural fill in order to decrease potential shrink-swell movements. The minimum separation is presented in Table 3.

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Minimum Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footings</td>
<td>2 feet</td>
</tr>
<tr>
<td>Floor Slabs, Living Space</td>
<td>2 feet</td>
</tr>
<tr>
<td>Floor Slab, Garage</td>
<td>2 feet</td>
</tr>
<tr>
<td>Exterior Concrete Slabs, including curbs, gutters, sidewalk*</td>
<td>1.5 feet</td>
</tr>
<tr>
<td>Asphalt Pavements</td>
<td>1.5 feet</td>
</tr>
</tbody>
</table>

* Includes aggregate base section.
The required separation may be achieved by any combination of site filling or overexcavation and replacement. Depending on final design elevations, considerable overexcavation could be required.

Clays to be left in place and covered with fill should be moisture conditioned to 2 to 4 percent over optimum for a minimum depth of 12 inches. This moisture level will significantly decrease the magnitude of shrink-swell movements in the upper foot of clay. The high moisture content must be maintained by periodic surface wetting, or other methods, until the surface is covered by at least one lift of fill.

All areas to receive structural fill or structural loading should be densified to, at least, 90 percent relative compaction. Where less than 70 percent passes the 3/4-inch sieve, as in alluvial fan areas, soils are too coarse for standard density testing techniques. In this case, as will occasionally occur here, a proof rolling of a minimum five single passes with a minimum 10-ton roller in mass grading, or five complete passes with hand compactors in footing trenches is recommended. This alternate has proved to provide adequate project performance, as long as all other geotechnical recommendations are closely followed. In all cases, the final surface should be smooth, firm, and exhibit no signs of deflection.

Existing ditches which are to be abandoned and are located in structural areas will require overexcavation to remove organic material and soft, wet, fine-grained soils. The overexcavation should extend to a depth of at least one to three feet below the ditch bottom, unless granular soils are encountered at shallower depth. The width of overexcavation will be dependent upon the extent of soft, wet soils that cannot be compacted. Ditch bottoms may require stabilization in accordance with later recommendations. Where irrigation ditches are to be perpetuated, it will be necessary to either re-route them around structural areas or replace the ditches with gasketed pipes. No piped ditches should underlie a house or its garage.

In areas of shallow ground water, or if wet weather construction is anticipated, soils may be well above optimum moisture and impossible to compact. In some situations, moisture conditioning may be possible by scarifying the top 12 inches of subgrade and allowing it to air dry to near-optimum moisture, prior to compaction. Where this procedure is ineffective or where construction schedules preclude delays, mechanical stabilization will be necessary. Mechanical stabilization may be achieved by overexcavations and/or placement of an initial 12- to 18-inch-thick lift of 12-inch-minus, 3-inch-plus, well graded, angular rock fill. The more angular and well graded the rock is, the more effective it will be. This fill should be densified with large equipment, such as a self-propelled sheeps-foot or a large loader, until no further deflection is noted. Additional lifts of rock may be necessary to achieve adequate stability. The use of a geotextile (Table 4) will prevent...
mud from “pumping” up between the rocks, thereby increasing rock-to-rock contact and decreasing the thickness of stabilizing fill.

As an alternate, overexcavation and a geotextile/gravel system may be used for stabilization. The geotextile should meet or exceed the following minimum properties:

<table>
<thead>
<tr>
<th>TABLE 4 - MINIMUM AVERAGE ROLL STRENGTH PROPERTIES FOR GEOTEXTILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezoid Strength (ASTM D 4533)</td>
</tr>
<tr>
<td>Puncture Strength (ASTM D 4833)</td>
</tr>
<tr>
<td>Grab Tensile/Elongation (ASTM D 4632)</td>
</tr>
</tbody>
</table>

A minimum of 18 inches of imported, coarse, stabilizing fill should be placed above the geotextile. Additional lifts of stabilizing fill may be necessary. The stabilizing can be obtained from the eastern alluvial fan deposits.

Regardless of which alternate is selected, a test section is recommended to determine the required thickness of stabilization.

Trenching and Excavation

Temporary trenches with near-vertical sidewalls should be stable to a depth of approximately 5 feet. Temporary trenches are defined as those that will be open for less than 24 hours. Excavations to greater depths will require shoring or laying back of sidewalls to maintain adequate stability. Regulations amended in Part 1926, Volume 54, Number 209 of the Federal Register (Table B-1, October 31, 1989) require that the temporary sidewall slopes be no greater than those presented in Table 5.

<table>
<thead>
<tr>
<th>TABLE 5 - MAXIMUM ALLOWABLE TEMPORARY SLOPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil or Rock Type</td>
</tr>
<tr>
<td>Stable Rock</td>
</tr>
<tr>
<td>Type A³</td>
</tr>
<tr>
<td>Type B</td>
</tr>
<tr>
<td>Type C</td>
</tr>
</tbody>
</table>

Notes:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.
3. A short-term (open 24 hours or less) maximum allowable slope of 1H:2V (63 degrees) is allowed in excavation in Type A soils that are 12 feet or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet in depth shall be 3H:4V (53 degrees).
These regulations, including the classification system and the maximum slopes, have been adopted and are strictly enforced by the State of Nevada, Department of Industrial Relations, Division of Occupational Safety and Health. In general, Type A soils are cohesive, non-fissured soils, with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Type B are cohesive soils with an unconfined compressive strength between 0.5 and 1.5 tsf, while those designated as Type C have an unconfined compressive strength below 0.5 tsf. Numerous additional factors and exclusions are included in the formal definitions. The client, owner, design engineer, and contractor shall refer to Appendix A and B of Subpart P of the previously referenced Federal Register for complete definitions and requirements on sloping and benching of trench sidewalls. Appendices C through F of Subpart P apply to requirements and methodologies for shoring.

On the basis of our exploration, the flood plain soils are predominately Type B, and the alluvial fan soils are Type C. Any area in question should be considered Type C, unless specifically examined by the geological engineer during construction. All trenching should be performed and stabilized in accordance with local, state, and OSHA standards.

Maximum particle size in the backfill should be 4 inches. In general, bedding and initial backfill 12 inches over the pipe will require import, but native granular soil will provide adequate final backfill as long as oversized particles from alluvial fan soils are excluded. Drain rock and backfill can be manufactured from the eastern alluvial fan soils. Bedding and initial backfill should conform to the requirements of the utility having jurisdiction, but should be densified to at least 90 percent relative compaction. Excavations below the ground water table will likely require dewatering. Below the waterline, bedding and backfill should consist of compacted drain rock graded in accordance with the requirements for Class C drain backfill presented in the City of Reno Standard Specifications for Public Works Construction. Above the waterline, trenches should be backfilled in maximum eight-inch-thick (loose) lifts in all structural areas. Each lift should be densified to a minimum of 90 percent relative compaction (ASTM D 1557). When drain rock is used as trench backfill, it shall be considered a rock backfill (greater than 30 percent retained on the 3/4-inch sieve) and should be placed in maximum 12-inch-thick loose lifts, with each lift densified by at least five complete passes with approved compaction equipment and until no deflection is observed. A separator geotextile such as Synthetic Industries Geotex 401 should be placed between the drain rock and any native soil backfill.

Grading and Filling

Native clay and fine-grained soils should be placed as fill only in nonstructural areas. Native granular soils will be suitable for structural fill provided particles larger than 8 inches are
removed. The minimum R-value for street subgrade will need to be 30. High-strength structural fill (subbase, R ≥45) will be required in areas of weak, native soil in order to provide a weighted average R-value of 30. Oversized rock can be stockpiled for later use as erosion protection or placed in the bottom of deep nonstructural fills. In deep fills, oversized rocks must be scattered in such a manner as to preclude development of voids between the particles (nesting).

All fill and utility trench backfill in structural areas should be densified to a minimum 90 percent relative compaction. Nonstructural fill should be densified to, at least, 85 percent relative compaction to minimize consolidation and erosion. If the native granular soils have greater than 30 percent retained on the ¾-inch sieve, standard density testing is not valid. A proof rolling program of at least five single passes of a minimum 10-ton roller in mass grading or at least five complete passes with hand compactors in footing trenches is recommended. Compaction must continue to the satisfaction of the geotechnical engineer. Acceptance of this rock fill is based upon observation of maximum particle size, lift thickness, moisture content, and applied compactive effort. In all cases, the finished surface should be smooth, firm, and show no signs of deflection. Grading should not be performed with or on frozen soils.

**Subsidence and Shrinkage**

In low-lying flood plain areas, subsidence of about 0.1 to 0.2 feet should be anticipated from construction traffic. Subsidence of granular alluvial fan soils exposed in cut should be negligible. Granular alluvial soils excavated and recompacted in structural fills should experience quantity shrinkage of approximately 10 to 15 percent, including removal of oversize particles. In other words, one cubic yard of excavated granular alluvium will generate about 0.85 to 0.90 cubic yards of structural fill at 90 percent relative compaction.

**Foundation Design**

The near-surface clays are poor foundation soils such that footings should not bear directly in these materials. The most economical method of foundation support lies in spread footings bearing on structural fill.

Individual column footings and continuous wall footings underlain by a minimum of 2 feet of structural fill or granular native soil fill can be designed for a net maximum allowable bearing pressure of 2,000 psf, and should have minimum footings widths of 16 and 12 inches, respectively. The net allowable bearing pressure is that pressure at the base of the footing in excess of the adjacent overburden pressure. This allowable bearing value should be used for dead plus ordinary live loads. Ordinary live loads are defined as being that portion of the design live...
load which will be present during the majority of the life of the structure. Design live loads are those loads which are produced by the use and occupancy of the building, such as by moveable objects, including people or equipment, as well as snow loads. This bearing value may be increased by one-third for total loads. Total loads are defined as the maximum load imposed by the required combinations of dead load, design live loads, snow loads, and wind or seismic loads.

With this allowable bearing pressure, total settlements of approximately ¼-inch should be anticipated. Differential settlements between footings with similar loads, dimensions, and base elevations should not exceed two-thirds of the values provided above for total settlements. The majority of the anticipated settlement will occur during the construction period as the loads are applied.

Lateral loads, such as wind or seismic, may be resisted by passive soil pressure and friction on the bottom of the footing. The recommended coefficient of base friction is 0.4 and has been reduced by a factor of 1.5 on the ultimate soil strength. Design values for active and passive equivalent fluid pressures are 37 and 370 pounds per square foot per foot of depth, respectively. These design values are based on spread footings bearing on and backfilled with structural fill. All exterior footings should be placed a minimum two feet below adjacent finish grade for frost protection.

If loose, soft, wet, or disturbed soils are encountered at the foundation subgrade, these soils should be removed to expose undisturbed competent bearing soils, and the resulting overexcavation backfilled with compacted structural fill. The base of all excavations should be dry and free of loose soils at the time of concrete placement.

**Slope Stability and Erosion Control**

Stability of cut and filled surfaces involves two separate aspects. The first concerns true slope stability related to mass wasting, landslides or the en masse downward movement of soil or rock. Stability of cut and fill slopes is dependent upon shear strength, unit weight, moisture content, and slope angle. The *Uniform Building Code* (ICBO, 1997), currently adopted by the City of Reno, allows cut and fill slopes up to 2H:1V in the type of soils present at this site. The exploration and testing program conducted during this investigation confirms 2H:1V slopes will be stable.

The second aspect of stability involves erosion potential and is dependent on numerous factors involving grain size distribution, cohesion, moisture content, slope angle, and the velocity of the water or wind on the ground surface. The City of Reno municipal code requires erosion control of cut and fill slopes 5H:1V or steeper. Slopes between 3H:1V and 5H:1V can be stabilized by
hydroseeding. Slopes steeper than 3H:1V require mechanical stabilization. The City of Reno may accept other methods of stabilization on slopes steeper than 3H:1V if it can be demonstrated to be as effective as mechanical stabilization. Details of the required erosion control are presented in the City of Reno Public Works Design Manual (2004). Protection could be provided by a variety of methods such as rip-rap or "geo-cell" systems. Rock rip rap can be obtained by screening the eastern alluvial fan deposits.

Dust potential at this site will be moderate during dry periods. Temporary (during construction) and permanent (after construction) erosion control will be required for all disturbed areas. The contractor shall prevent dust from being generated during construction in compliance with all applicable city, county, state, and federal regulations and shall submit an acceptable dust control plan to the Washoe County District Health Department prior to starting site preparation or earthwork. The project specifications should include an indemnification by the contractor of the owner and engineer for any dust generation during the construction period. The owner will be responsible for mitigation of dust after his acceptance of the project.

In order to minimize erosion and downstream impacts to sedimentation from this site, best management practices with respect to storm water discharge should be implemented at this site.

Site Drainage

Adequate surface drainage should be provided away from the structure. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations unless pavement extends to the walls. Stemwall backfill should be thoroughly compacted to decrease permeability and reduce the potential for irrigation and storm water to enter the crawlspace or seep beneath the floor slab. A perimeter foundation drain should be included on each house, particularly if raised floor construction is used. Positive crawlspace drainage should also be provided by grading the crawlspace to drain to one or more localized areas and providing 3-inch diameter pipes to daylight beneath the footings. Often, design grades preclude adequate drainage by daylighting a direct drain. A less preferable alternate is to grade the crawlspace to drain to the sewer lateral and gravel packing the lateral from the crawlspace to the sewer main in the street. Ponding of water on finish grade or at the edge of pavements should be prevented by proper grading.

Concrete Slabs

All concrete slabs should be directly underlain by imported, granular material with a minimum R-value of 60. Type 2, Class B, aggregate base is the preferred alternate, although other materials
may be acceptable. The thickness of base material shall be 6 inches beneath curb and gutters, 4 inches beneath sidewalks and 4 inches beneath private flatwork. Aggregate base courses should be densified to at least 95 percent relative compaction. Base materials can be manufactured from the eastern alluvial fan deposits.

The soils in the low-lying flood plain area are low-energy deposits, and, as such, include localized areas with high levels of sodium and calcium sulfate. Deposits of the white alkali salts can be seen in the area as they begin to dry out, and visible gypsum was seen in some of the test pits. Soluble sulfate minerals, particularly sodium sulfate, aggressively attack the surface of low strength porous concrete. Standard 4,000 pounds per square in (psi) concrete with Type II cement, such as required for dedicated improvements, is normally adequately resistant to sulfate attack, especially when separated from native soil by several feet of imported fill. Footing and stemwall concrete is often of much lower strength and is poured very wet so that it becomes relatively porous. If native clay soils are used as stemwall backfill in yard areas, the sulfate will attack and severely spall the concrete, just above the ground line. This spalling occurs as the very soluble salts “wick” up the surface of the porous stemwall concrete and then precipitate as the moisture evaporates. This problem can be prevented in three ways, listed in order of preference:

- Use 4,000 psi (“City Mix”) concrete for stemwalls, garage floors, and driveways.
- Use imported backfill within 3 feet of the stemwall and private flatwork.
- Coat the stemwalls with a suitable concrete sealer.

Each phase of the development should be checked for sulfate levels to determine the need for these measures.

Type II cement should be used for all concrete work. The Reno area is a region with exceptionally low relative humidity. As a consequence, concrete flatwork is prone to excessive shrinking and curling. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of the concrete and result in cracking, curling, and spalling of slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute (1999). Special considerations should be given to concrete placed and cured during hot or cold weather conditions. Proper control joints and reinforcing should be provided to minimize any damage resulting from shrinkage. Concrete should not be placed on frozen in-place soils.

Any interior concrete slab floors with moisture-sensitive flooring will require a moisture barrier system. Installation should conform to the specifications provided for a Class B vapor restraint (ASTM E-1745-97). A 4-inch-thick layer of clean sand or aggregate base should be placed over
the vapor barrier and be, compacted with a vibratory plate. The base layer should remain compacted and a uniform thickness maintained during the concrete pour, as its intended purpose is to facilitate even curing of the concrete and minimize curling of the slab. Care should be taken during construction to ensure that rebar reinforcement, forming stakes, and equipment do not damage the integrity of the vapor barrier.

**Asphalt Concrete**

The project is in preliminary stages so that street layout and traffic volumes are unavailable at this time. Structural section design of pavement is therefore preliminary as well. The City of Reno requires that all roadway subgrade exhibit an R-value of at least 30 (City of Reno, 2004). The City does not specify how that requirement will be achieved, but it typically involves removal of low-strength soil and replacement with imported fill (subbase) with an R-value of at least 45 to provide a weighted average 30.

The subgrade strength in eastern alluvial fan areas is high, so that City of Reno minimum structural sections (4 inches of asphalt concrete and 6 inches of Type 2, Class B aggregate base) are appropriate for residential streets. The low-lying flood plain soils often have weak subgrade strengths that will require the addition of 12-inch granular subbase with a minimum R-value of 45 beneath these minimum structural sections to meet City standards. Collector streets would typically have the sections increased to 5 inches of asphalt concrete over 8 inches of base. Arterials will require special analysis and design.

**Pavement Drainage**

Pavement design is mostly a function of heavy truck traffic and subgrade strength. Inherent in the selection of design subgrade strength is the assumption that the subgrade will not become saturated. Subgrade strength drops dramatically with even a slight moisture increase above that selected for the design value. This is essentially true for any material other than clean sands and gravels and is more critical in fine-grained and clay soils than in granular soils. Soils in the low-lying flood plain area are considered to be of high moisture sensitivity. Where irrigated landscaping is to be placed adjacent to the pavement section, we recommend that edge drains be constructed directly behind the curb, or along the edge of the asphalt where curbs and gutters are not used. This recommendation includes both center median and edge or back face of curb/sidewalk areas with irrigated landscaping and is particularly important where irrigated landscape mounds slope toward the street section. If proper drainage is not provided, increased maintenance costs and premature pavement (subgrade) failure will result.
The edge drain should extend at least 12 inches below the street subgrade and can consist of either a narrow trench backfilled with Class B or C drain rock or a synthetic edge drain product. Drain rock should be separated from native soil backfill by a geotextile such as Geotex 311 or equal. In cohesionless soils the fabric should also be placed on the upslope side, between the native soils and the drain rock/backfill. The edge drain should be tied into the storm drain or drain rock backfill around the storm drain. In some cases utility trenches located behind the street could be utilized as edge drains, if designed and constructed with that intent.

**Pavement Maintenance**

Asphalt concrete pavements have been designed for a standard 20-year life expectancy with the design assumptions presented under Pavement Design. Due to the local climate and available construction aggregates, a full 20 years of performance life are seldom achieved. Between 15 and 20 years from initial construction (average 17 years), major rehabilitation (structural overlay or reconstruction) is generally required. To achieve even this performance life, periodic maintenance is required. Such maintenance includes regular crack sealing, seal coats, and patching as necessary. Failure to provide the required maintenance will significantly reduce pavement design life and performance.

**Corrosion Potential**

Soluble sulfate content has been determined for representative samples of the site foundation soils, and the results of the testing indicate that concrete in contact with the site foundation soils should experience moderate degradation due to reaction with soil sulfate. Therefore, Type II cement should be used for all concrete work.

Laboratory testing on representative samples of site foundation soils was also performed to evaluate the corrosion potential of the soils with respect to buried steel structures. The results of the laboratory testing indicate that the site foundation soils exhibit a high degree of corrosivity.

**ANTICIPATED CONSTRUCTION PROBLEMS**

Soft, wet, surface soils may make for difficult travel by construction equipment. Trenching below the water table will require dewatering. Some difficulty will also be encountered in trenching due to the presence of boulders in areas of granular alluvial fan soil.
QUALITY CONTROL

All plans and specifications should be reviewed for conformance with this geotechnical report and approved by the geotechnical engineer prior to submitting to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field testing and construction review will be provided during all phases of construction. We should review the final plans and specifications for conformance with the intent of our recommendations. Prior to construction, a pre-job conference should be scheduled to include, but not be limited to, the owner, architect, civil engineer, the general contractor, earthwork and materials subcontractors, building official, and geotechnical engineer. The conference will allow parties to review the project plans, specifications, and recommendations presented in this report and discuss applicable material quality and mix design requirements. All quality control reports should be submitted to and reviewed by the geotechnical engineer.

During construction, we should have the opportunity to provide sufficient on-site observation of preparation and grading, overexcavation, fill placement, foundation installation, and paving. These observations would allow us to verify that the geotechnical conditions are as anticipated and that the contractor's work is in conformance with the approved plans and specifications.

STANDARD LIMITATIONS CLAUSE

This report has been prepared in accordance with generally accepted geotechnical practices. The analyses and recommendations submitted are based on field exploration performed at the locations shown on Plate 1 - Plot Plan of this report. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to ensure compliance with our recommendations. The owner shall be responsible for distribution of this geotechnical investigation to all designers and contractors whose work is related to geotechnical factors.

Equilibrium water level readings were made on the date shown on Plate 2 - Boring/Test Pit Logs of this report. Fluctuations in the water table may occur due to rainfall, temperature, seasonal runoff or adjacent irrigation practices. Construction planning should be based on assumptions of possible variations.
This report has been prepared to provide information allowing the architect or engineer to design the project. The owner is responsible for distribution of this report to all designers and contractors whose work is affected by geotechnical aspects. In the event of changes in the design, location, or ownership of the project from the time of this report, recommendations should be reviewed and possibly modified by the geotechnical engineer. If the geotechnical engineer is not accorded the privilege of making this recommended review, he can assume no responsibility for misinterpretation or misapplication of his recommendations or their validity in the event changes have been made in the original design concept without his prior review. The geotechnical engineer makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of this agreement and included in this report.

REFERENCES

American Concrete Institute, 1999, *ACI Manual of Concrete Practice: Parts 1 through 5.*


Black Eagle Consulting, Inc.


*Standard Specifications for Public Works Construction*, 2002 (Washoe County, Sparks-Reno, Carson City, Yerington, Nevada).


PLATES

COPY
UPPER COLORED BLOCK REPRESENTS DOMINANT SOIL TYPE IN UPPER HALF OF TEST PIT OR BORING. WHEREAS LOWER COLORED BLOCK REPRESENTS DOMINANT SOIL TYPE IN LOWER HALF OF TEST PIT OR BORING.

1. BASE MAP PROVIDED BY CENTEX HOMES.

NOTES

- FLOOD PLAIN DEPOSITS TO THE WEST,
- ALLUVIAL FAN DEPOSITS TO THE EAST

SOIL TYPE
- UPPER HALF: [
- INTERVAL < 0.075 MILLIMETERS]
- LOWER HALF: [
- INTERVAL > 0.075 MILLIMETERS]

CENTEX HOMES
Bella Vista Ranch
RENO, NEVADA

Site Location Map
N.T.S.

Scale: 1" = 1000'
MIDER
KE
SCALE: 1" = 1000'

memo.
war
war
wave
osseaviewas
TP-02
.MSTAU.ED-

sh
v
BORE
HOi-E
WilH
MONITORING
WELL
8-03
INSTALLED
- 5'
DEPTI-1
To
GROUNDwATER
TABLE
5'
- 10'
DEPfH
TO
GROUNDwATER
TABLE

NOTES
1. BASE MAP PROVIDED BY CENTEX HOMES

SITE LOCATION MAP
NTS.

CENTEX HOMES
GROUND WATER TABLE
BELLA VISTA RANCH
RENO, NEVADA

SITE LOCATION

Project No.
0199-06-1
Plate 1c

SITE LOCATION

TOWNSHIP 18N
RANGE 2SE

B UNITS

- SITE BOUNDARY

WELL
8-03
MONITORING
WELL
TP-02

TEST PIT WITH OBSERVATION WELL
INSTALLED
BORING HOLE WITH MONITORING WELL
INSTALLED
0 - 5' DEPTH TO GROUNDWATER TABLE
5' - 10' DEPTH TO GROUNDWATER TABLE
> 10' DEPTH TO GROUNDWATER TABLE

1. BASE MAP PROVIDED BY CENTEX HOMES

SITE LOCATION

CENTEX HOMES
GROUND WATER TABLE
BELLA VISTA RANCH
RENO, NEVADA

N.T.S.
BORING LOG

BORING NO.: B-01
DATE: 6/15/2004

TYPE OF BORING: CME 55

DEPTH TO GROUND WATER (ft): 21.0

LOGGED BY: TWJ
GROUND ELEVATION (ft): 4437 (Topo)

DEPTH (ft) USCS SYMBOL LITHOLOGY DESCRIPTION

0.0' - 2.0': Silty Sand light brown, slightly moist, loose from 0.0-0.1' and medium dense from 0.1-1.5', with estimated 20% non-plastic fines and 80% fine to coarse sand. With moderate roots to 1/4" in diameter.

2.0' - 3.4': Silty Sand brown, slightly moist, loose, with estimated <5% non-plastic fines and 95% to coarse sand. Fines have low plasticity in last 2" of the interval.

3.4' - 4.5': Lean Clay dark brownish black, moist, firm, with estimated 100% medium plastic fines.

4.5' - 7.0': Lean Clay with Sand dark brown, moist, stiff, with 76% medium plastic fines, 23% fine to coarse sand, and 1% fine gravel. Material breaks at 4.0 tsf using the pocket penetrometer. Switch to mud rotary drilling after 6.5 feet.

7.0' - 8.5': Fat Clay dark brown, moist, very stiff, with estimated 95% high plastic fines and 5% fine to medium sand.

8.5' - 9.5': Silty Sand brown, moist, medium dense, with estimated 15% non-plastic fines, 80% fine to coarse sand, and 5% subrounded gravel to 1/4".

9.5' - 12.0': Fat Clay dark grayish brown; moist, firm, with estimated 95% high plastic fines and 5% fine sand.

12.0' - 12.9': Silty Sand brown, moist, loose, with estimated 15% non-plastic fines and 85% fine to medium sand. Pocket penetrometer = 0 tsf.

12.9' - 14.5': Silty Clay with Sand mottled from brown to dark green, very moist, firm, with estimated 95% low plastic fines and 15% fine to medium sand.

14.5' - 18.0': Interbedded Lean Clay and Silty Sand dark brown, moist, very stiff, with estimated 95% high plastic fines and 5% fine sand.

Located 130 feet east of ranch road.

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(775) 359-6600

Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1
PLATE: 2a
SHEET 1 OF 3
<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/12 inches</th>
<th>MOISTURE (%)</th>
<th>DEPTH (ft)</th>
<th>USGS SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>SPT</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>greenish black, very moist silty sand with estimated 20% non-plastic fines and 80% fine to medium sand. Interbedded with dark black lean clay with estimated 90% medium plastic fines and 20% fine sand. Pocket penetrometer = 0.5-0.65 tsf.</td>
</tr>
<tr>
<td>H</td>
<td>SPT</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>18.0' - 23.0': Lean Clay dark greenish black, very moist to wet, soft, with estimated 90% medium plastic fines and 10% fine sand.</td>
</tr>
<tr>
<td>I</td>
<td>SPT</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>23.0' - 28.0': Interbedded Silty Sand, Clayey Sand, and Sandy Lean Clay. dark greenish black, wet, loose. Material from 25.0-25.25' consists of Silty Sand with estimated 15% non-plastic fines and 85% fine to medium sand. The remaining material from 25.25-26.5' consists of interbedded Clayey Sand with estimated 20% low plastic fines and 80% fine to medium sand, and Sandy Lean Clay with estimated 65% low plastic fines and 35% fine to medium sand. Pocket penetrometer = 1.75-2.25 tsf.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28.0' - 33.0': Poorly Graded Gravel with Sand dark gray, wet, dense, with estimated &lt;5% non-plastic fines, 40% fine to coarse sand, and 55% rounded to subrounded gravel to 1/2&quot;. Pocket penetrometer = 1.5-2.0 (material breaks).</td>
</tr>
</tbody>
</table>

Located 130 feet east of ranch road.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1
PLATE: 2b
SHEET 2 OF 3
<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/12 inches</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>UCSS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>SPT</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GP</td>
<td>33.0' - 38.0': Poorly Graded Sand with Silt and Gravel dark gray, wet, medium dense, with estimated 5% non-plastic to low plastic fines, 80% fine to coarse sand, and 15% rounded to subrounded gravel to 3/8&quot;. Very low recovery from 35.0-36.5 feet.</td>
</tr>
<tr>
<td>K</td>
<td>SPT</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td>38.0' - 41.0': Poorly Graded Gravel gray, wet, dense, with estimated &lt;5% non-plastic fines, &lt;5% fine to coarse sand, and 90% subrounded gravel to 1/2&quot;.</td>
</tr>
<tr>
<td>L1</td>
<td>SPT</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GP-SM</td>
<td>41.0' - 41.4': Poorly Graded Gravel with Sand gray, wet, dense, with estimated &lt;5% non-plastic fines, 35% fine to coarse sand, and 60% subrounded gravel to 1/2&quot;. 41.4' - 41.5': Silty Sand olive gray, wet, dense, with estimated 15% non-plastic fines and 85% fine to coarse sand.</td>
</tr>
</tbody>
</table>

Located 130 feet east of ranch road.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1
PLATE: 2c
SHEET 3 OF 3
**BOARING NO.:** B-02  
**TYPE OF BORING:** CME 55  
**LOGGED BY:** TWJ  
**DATE:** 6/16/2004  
**DEPTH TO GROUND WATER (ft):** 6.9  
**GROUND ELEVATION (ft):** 4431 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/12 inches</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>USCS SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SPT</td>
<td>4</td>
<td></td>
<td></td>
<td>CL</td>
<td>0.0'-0.2': Fat Clay dark brown, moist, soft, with estimated 90% high plastic fines and 10% fine sand. With strong roots.</td>
</tr>
<tr>
<td>B</td>
<td>SPT</td>
<td>11</td>
<td></td>
<td></td>
<td>SM</td>
<td>0.2'-0.8': Silty Sand brown, slightly moist, very loose, with estimated 15% non-plastic fines and 85% fine to coarse sand.</td>
</tr>
<tr>
<td>C</td>
<td>SPT</td>
<td>13</td>
<td></td>
<td></td>
<td>CL</td>
<td>0.8'-2.0': Lean Clay dark brownish black, moist, very hard, with estimated 95% medium plastic fines and 5% fine sand.</td>
</tr>
<tr>
<td>D</td>
<td>SPT</td>
<td>15</td>
<td></td>
<td></td>
<td>CL</td>
<td>Pocket penetrometer = 4.0 tfs (material breaks).</td>
</tr>
<tr>
<td>E</td>
<td>SPT</td>
<td>8</td>
<td></td>
<td></td>
<td>SP-SM</td>
<td>2.0'-3.0': Lean Clay brown, moist, stiff, with estimated 80% low plastic fines and 20% fine to medium sand. Pocket penetrometer = 2.75 tfs.</td>
</tr>
<tr>
<td>F</td>
<td>SPT</td>
<td>15</td>
<td></td>
<td></td>
<td>CL</td>
<td>3.0'-4.5': Poorly Graded Sand with Silt brown, moist, medium dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. Fines in last 1.5' of interval are low plastic. With trace to Lean Clay with Sand brown, moist, stiff, with estimated 80% low plastic fines and 20% fine to medium sand.</td>
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<td></td>
<td>5.0'-7.0': Sandy Lean Clay with Sand brown, very moist to wet, stiff, with estimated &lt;5% non-plastic fines and 95% fine to coarse sand. Last 1' of interval consists of dark brown and slightly moist Sandy Lean Clay (not sampled). With trace rootlets. Switch to mud-rotary drilling greater than 6.5 feet. Water sample collected on 6/17/04 and submitted for chemical analysis.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>7.0'-8.0': Lean Clay with Sand dark greenish gray, wet, stiff, with estimated 75% medium plastic fines and 25% fine to medium sand. Pocket penetrometer = 2.25 tfs.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td>8.0'-9.5': Silty Sand dark greenish gray, wet, medium dense, with estimated 20% non-plastic fines and 80% fine to medium sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>10.0'-12.0': Lean Clay with Sand from 10.0-10.1' is dark greenish gray, wet Clayey Sand (not sampled) with estimated 15% medium plastic fines and 85% fine to medium sand and trace gravel to 1/4&quot;. Most material from 10.1-11.5' consists of dark clay and wet Lean Clay with Sand with estimated 85% medium plastic fines and 15% fine sand. Pocket penetrometer = 1.5 tfs.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>CL</td>
<td>12.0'-14.5': Lean Clay dark greenish gray, wet, stiff, with estimated 95% medium plastic fines and 5% fine sand. Pocket penetrometer = 3.0-3.5 tfs from 12.5-13.5' and 2.75 tfs from 13.5-14.0'.</td>
</tr>
</tbody>
</table>
|            |             |                 |              |                   |             | 14.5'-16.0': Silty Sand dark greenish gray, wet, loose, with

Located 540 feet north of fence line and 680 feet southeast of TP-8.
### BORING LOG

**BORING NO:** B-02  
**DATE:** 6/16/2004  
**TYPE OF BORING:** CME 55  
**DEPTH TO GROUND WATER (ft):** 6.9  
**GROUND ELEVATION (ft):** 4431 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/12 Inches</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>G/G1</td>
<td>SPT</td>
<td>10</td>
<td>SM</td>
<td></td>
<td></td>
<td></td>
<td>estimated 15% non-plastic fines, 73% fine to coarse sand, and 12% subrounded gravel to 3/8&quot;. Pocket penetrometer = 2.5 tsf (material breaks).</td>
</tr>
<tr>
<td>H</td>
<td>SPT</td>
<td>7</td>
<td>SC-SC</td>
<td></td>
<td>18.0' - 23.5': Clayey Sand dark grayish green, wet, loose, with estimated 40% low plastic fines and 60% fine to medium sand. More fines in upper half of interval. Pocket penetrometer = 1.0-1.5 tsf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>SPT</td>
<td>50 in 5&quot;</td>
<td>GP-GM</td>
<td></td>
<td>23.5' - 28.0': Poorly Graded Gravel with Silt and Sand dark greenish black, wet, very dense, with estimated 5% non-plastic fines, 25% fine to coarse sand, and 70% subrounded gravel to 1-1/2&quot;.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28.0' - 33.0': Poorly Graded Gravel dark greenish gray, wet, very dense. Only trace recovery due to two pieces of subrounded gravel to 1-1/2&quot; in diameter jammed in shoe. Very difficult drilling with tricone bit.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Located 540 feet north of fence line and 680 feet southeast of TP-8.

---

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**Centex Homes**  
Bella Vista Ranch  
Reno, Nevada

**PROJECT NO.:** 0199-08-1  
**PLATE:** 2c  
**SHEET 2 OF 3**
BORING LOG

BORING NO.: B-02
DATE: 6/16/2004

TYPE OF BORING: CME 55
DEPTHTO GROUND WATER (ft): 6.9

LOGGED BY: TWJ
GROUND ELEVATION (ft): 4431 (Topo)

<table>
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<th>SAMPLE NO.</th>
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<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>SPT</td>
<td>50 in 6&quot;</td>
<td></td>
<td></td>
<td></td>
<td>GP</td>
<td>33.0' - 35.7': Poorly Graded Gravel dark gray, wet, very dense, unconsolidated material, with estimated &lt;5% non-plastic fines, 20% fine to coarse sand, and 75% subrounded to subangular gravel to 3/4&quot;.</td>
</tr>
</tbody>
</table>
| KJK1       | SPT         | 82             |              |                  |           | GP-GN       | 35.7' - 36.3': Poorly Graded Gravel with Silt and Sand dark greenish gray, wet, very dense, with estimated 7% non-plastic fines, 73% fine to coarse sand, and 20% subrounded to subangular gravel to 3/4".  
- used tricone bit to 40'; hole keeps caving in after reaming hole out twice. Stop hole at 40' at 10:35 a.m.  
- Drill a twin hollow-stem auger boring 5 feet east of mud-rotary hole and set 2-6/16" (O.D) PVC pipe in hole to observe ground water table elevation. Ground water table measured at 6.9 feet below surface on 6-17-04 at 12:10 p.m. |

Located 540 feet north of fence line and 880 feet southeast of TP-8.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2d

SHEET 3 OF 3
<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>TYPE</th>
<th>BLOWS/12 INCHES</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/A1</td>
<td>SPT</td>
<td>6</td>
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<td></td>
<td></td>
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<tr>
<td>B</td>
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<td>C/C1</td>
<td>SPT</td>
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</tr>
<tr>
<td>D</td>
<td>SPT</td>
<td>11</td>
<td></td>
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<tr>
<td>E/E1</td>
<td>SPT</td>
<td>18</td>
<td></td>
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<tr>
<td>F</td>
<td>SPT</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION**

- **0.0' - 0.4':** Poorly Graded Sand with Silt brown, dry, loose, with estimated 5% non-plastic fines and 95% fine to coarse sand. With moderate roots.
- **0.4' - 0.7':** Lean Clay brown, moist, firm, with estimated 95% low plastic fines and 5% fine sand.
- **0.7' - 1.0':** Poorly Graded Sand brown, slightly moist, loose, with estimated <5% non-plastic fines and 95% fine to coarse sand. 28-2.0': Silt with Sand brown, moist, firm, with estimated 85% non-plastic fines and 15% fine sand.
- **2.0' - 4.5':** Silty, Clayey Sand brown, moist, loose, interbedded Silty Sand and Clayey Sand, with estimated 20% non-plastic to low plastic fines, 80% fine to medium sand, and trace subangular gravel to 3/4" in last 2-1/2". With trace rootlets. Pocket penetrometer = 2.0 tsf (material breaks) from 2.5-3.0'; 0 tsf from 3.0-4.0'.
- **4.5' - 5.3':** Silty Sand brown, moist to wet, loose, with estimated 25% non-plastic fines and 75% fine to medium sand. With trace rootlets. Pocket penetrometer = 0 tsf.
- **5.3' - 5.5':** Clayey Sand brown, wet, loose, with estimated 30% low plastic fines and 70% fine to medium sand.
- **5.5' - 7.0':** Fat Clay dark brownish black, wet, firm, with estimated 95% medium to high plastic fines and 5% fine sand. Pocket penetrometer = 1.0-1.25 tsf. Switch to mud-rotary drilling greater than 6.5 feet.
- **7.0' - 7.9':** Silty Sand dark greenish black, wet, medium dense, with estimated 20% non-plastic fines, 70% fine to coarse sand, and 10% subrounded gravel to 1/4". Pocket penetrometer = 0 tsf.
- **7.9' - 9.5':** Sandy Lean Clay dark greenish black, wet, stiff, with estimated 60% medium plastic fines and 40% fine to medium sand. Pocket penetrometer = 2.25 tsf.
- **9.5' - 10.7':** Lean Clay dark greenish gray, wet, very stiff, with estimated 90% medium plastic fines and 10% fine sand. Pocket penetrometer = 1.0-1.75 tsf.
- **10.7' - 12.0':** Poorly Graded Sand with Silt dark gray, wet, medium dense, with estimated 5% non-plastic fines and 95% fine to coarse sand.
- **12.0' - 14.5':** Silty Sand dark greenish black, wet, medium dense, with estimated 30% non-plastic fines and 70% fine to coarse sand. Pocket penetrometer = 0-0.5 tsf (material breaks).
- **14.5' - 15.5':** Silty, Clayey Sand dark gray, wet, medium dense.

Located in middle of meadow.
<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/12 inches</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>G/G1</td>
<td>SPT</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td>SC-SM</td>
<td></td>
<td>with estimated 20% medium plastic fines and 80% fine sand. Pocket penetrometer = 1.25 tsf.</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>15.5' - 18.0': Lean Clay dark gray, wet, stiff, with estimated 90% medium plastic fines and 10% fine sand. Pocket penetrometer = 2.5-2.75 tsf.</td>
</tr>
<tr>
<td>H</td>
<td>SPT</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td></td>
<td>18.0' - 20.0': Clayey Sand dark greenish gray, wet, medium dense, with estimated 30% low plastic fines and 70% fine to medium sand. Pocket penetrometer = 0.5-1.25 tsf.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>20.0' - 21.3': Poorly Graded Sand with Silt dark gray, wet, medium dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. Pocket penetrometer = 0 tsf.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td>21.3' - 23.0': Lean Clay with Sand dark greenish black, wet, very stiff, with estimated 80% medium plastic fines and 20% fine to medium sand. Material not sampled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td></td>
<td>23.0' - 26.3': Silty, Clayey Sand dark greenish gray, wet, medium dense, with estimated 25% low plastic fines and 75% fine to medium sand. Pocket penetrometer = 0.5 tsf.</td>
</tr>
<tr>
<td>I/I1</td>
<td>SPT</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td>SC-SM</td>
<td></td>
<td>26.3' - 27.5': Silty Sand dark greenish gray, wet, medium dense, with estimated 20% non-plastic fines and 80% fine to medium sand. Pocket penetrometer = 2.25 tsf.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27.5' - 33.0': Poorly Graded Gravel dark gray, wet, dense, unconsolidated, with estimated &lt;5% non-plastic fines, 13% fine to coarse sand, and 82% subrounded to subangular gravel to 1-1/2&quot;. Difficult auger drilling from 27.5 to 33.0 feet. Hole keeps caving at 33.0 feet. Stop hole at 33.0 feet at 1:55 p.m.</td>
</tr>
</tbody>
</table>

Located in middle of meadow.

Black Eagle Consulting, Inc.  
1345 Capital Blvd., Suite A  
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(775) 359-6600

Centex Homes  
Bella Vista Ranch  
Reno, Nevada

PROJECT NO.:  
0199-08-1

PLATE:  
2d

SHEET 2 OF 3
**BORING LOG**

**BORING NO.:** B-03  
**DATE:** 6/16/2004  
**TYPE OF BORING:** CME 55  
**DEPTH TO GROUND WATER (ft):** 4.6

**LOGGED BY:** TWJ  
**GROUND ELEVATION (ft):** 44415 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/12 Inches</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>SPT</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GP</td>
<td>Drill hollow-stem auger hole 7 feet north of mud-rotary hole and install 2-6/16&quot; (O.D.) PVC pipe 20 feet long to observe the ground water table elevation. Measured ground water table on 6-17-04 is 4.6 feet below the surface.</td>
</tr>
</tbody>
</table>

Located in middle of meadow.

---

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Reno, Nevada

PROJECT NO.: 0199-08-1  
PLATE: 2e  
SHEET 3 OF 3
TEST PIT NO.: TP-01

DATE: 6/16/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 11

GROUND ELEVATION (ft): 4444 (Topo)

LOGGED BY: DPM

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>LIQUID LIMIT</th>
<th>SOLID LIMIT</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td>CLAYEY SAND</td>
<td>0.0' - 0.5': CLAYEY SAND, brown, dry, loose, with estimated 35-40% medium plasticity fines and 60-65% fine to coarse sand. Very abundant organic material and roots present.</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP</td>
<td>POORLY GRADED SAND</td>
<td>0.5' - 1.0': POORLY GRADED SAND brown, slightly moist, loose, with estimated trace non-plastic fines and 100% fine to medium sand.</td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>SANDY LEAN CLAY</td>
<td>1.0' - 1.9': SANDY LEAN CLAY brown, slightly moist, medium dense, with estimated 45-50% medium plasticity fines and 55-60% fine sand. Roots and oxidation encountered.</td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td>SILTY SAND</td>
<td>1.9' - 2.5': SILTY SAND white and light grey, slightly moist, medium dense, with estimated 40-45% low plasticity fines and 55-60% fine sand. Roots and oxidation encountered.</td>
</tr>
<tr>
<td>E</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td>CLAYEY SAND</td>
<td>2.5' - 3.5': CLAYEY SAND grey, slightly moist, medium dense, with estimated 15-20% low plasticity fines and 80-85% fine sand. Roots and oxidation encountered.</td>
</tr>
<tr>
<td>F</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>LEAN CLAY with SAND</td>
<td>3.5' - 4.0': LEAN CLAY with SAND dark brown, slightly moist, medium dense, with estimated 45% medium plasticity fines and 55% fine to coarse sand. Abundant roots encountered.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>LEAN CLAY with SAND</td>
<td>4.0' - 8.0': LEAN CLAY with SAND black and dark brown, slightly moist, firm to stiff, with estimated 80-90% medium plasticity fines and 10-20% fine sand. Grades to higher percentage sand, estimated from tailings. Hole caving occurs at 7 feet below grade.</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>LEAN CLAY with SAND</td>
<td>8.0' - 13.0': LEAN CLAY with SAND black and dark grey, moist to wet, firm, with estimated 80-90% medium plasticity fines and 10-20% fine sand.</td>
</tr>
</tbody>
</table>

Located south of Alexander Lake access road.
TEST PIT NO.: TP-02

DATE: 6/10/2004

DEPTH TO GROUND WATER (ft): 2.7

GROUND ELEVATION (ft): 4438 (Topo)

LOGGED BY: DPM

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 2.7

GROUND ELEVATION (ft): 4438 (Topo)

LOCATION:

Located 50 feet southeast of Steamboat Creek. PVC pipe installed to monitor ground water.

A

GRAB <.5

B

GRAB

LOCATION:

Located 50 feet southeast of Steamboat Creek. PVC pipe installed to monitor ground water.

Description

0.0' - 0.4': **TOPSOIL**

0.4' - 1.0': **SILTY SAND** grey and brown, moist, medium dense, with estimated 20% low plasticity fines and 80% fine to coarse sand with roots.

1.0' - 1.5': **SILTY SAND** grey, wet, loose to medium dense, with estimated 35% low plasticity fines and 65% fine sand.

1.5' - 2.0': **POORLY GRADED SAND with SILT** grayish-brown, wet, loose, with estimated 5-10% non-plastic fines and 90-95% fine to coarse sand.

2.0' - 5.0': **LEAN CLAY** black, wet, soft, with estimated 85-90% low to medium plasticity fines and 10-15% fine sand. Water Sample collected on 6/17/04 and submitted for chemical analysis. Hole caving and water pumping at 2.7 feet below grade.

5.0' - 8.0': **SILTY SAND** dark grey, wet, loose, with estimated 30% low plasticity fines, 60% fine to coarse sand, and 10% fine subrounded gravel. Estimated from tailings.

8.0' - 9.5': **SANDY SILT** blue-green and grey, wet, soft, with estimated 55% low plasticity fines and 45% fine to coarse sand. Estimated from tailings.

- Install slotted PVC pipe to observe ground water table elevation. Measured ground water table on 6/17/04 is 2.7 feet below the ground surface.

Located 50 feet southeast of Steamboat Creek. PVC pipe installed to monitor ground water.
# Test Pit Log

**Test Pit No.:** TP-03

**Type of Hoe:** Case 580 Super L Rubber tire back hoe

**Logged By:** DPM

**Date:** 6/10/2004

**Depth to Ground Water (ft):** NE

**Ground Elevation (ft):** 4440 (Topo)

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Penetrometer (tsp)</th>
<th>Moisture (%)</th>
<th>Moisture Index</th>
<th>Depth (ft)</th>
<th>USCS Symbol</th>
<th>Lithology</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>• GRAB</td>
<td>4.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0' - 0.5': <strong>TOPSOIL</strong> brown, slightly moist, medium dense, with abundant organic material.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>0.5' - 1.5': <strong>POORLY GRADED SAND</strong> brown, slightly moist, medium dense, with estimated trace non-plastic fines, 100% fine to coarse sand, and trace fine subrounded gravel.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>1.5' - 2.0': <strong>SILT with SAND</strong> light grey to black, dry, very stiff, with estimated 75-85% non-plastic to low plasticity fines and 15-25% fine sand. Thin black sandy silt seam at bottom.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>2.0' - 5.0': <strong>POORLY GRADED SAND</strong> brown, slightly moist, loose to medium dense, with estimated trace non-plastic fines, 90% fine to coarse sand, and 10% fine subrounded gravel. Soil sample submitted for chemical analysis.</td>
</tr>
<tr>
<td>B</td>
<td>• GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.0' - 5.5': <strong>SILTY SAND</strong> black and brown, slightly moist, medium dense, with estimated 35% low plasticity fines and 65% fine sand: <strong>SANDY SILT</strong> black and brown, slightly moist, stiff, with estimated 60-70% low plasticity fines and 30-40% fine to medium sand. Interbedded layers with weak to moderate cementation encountered. Estimated from tailings.</td>
</tr>
<tr>
<td>C</td>
<td>• GRAB</td>
<td>2.5 - &gt;5.0</td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td>8.0' - 10.0': <strong>LEAN CLAY with SAND</strong> black, slightly moist to moist, stiff, with estimated 80% medium plasticity fines and 20% fine sand. Estimated from tailings.</td>
</tr>
</tbody>
</table>

Located in abandoned pasture approximately 30 feet west of dry irrigation ditch and 188 feet south of fence line.

---

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Bella Vista Ranch
Reno, Nevada

**Project No.:** 0199-08-1

**Plate:** 2f

**Sheet 1 of 1**
### TEST PIT LOG

**TEST PIT NO.:** TP-04  
**DATE:** 6/16/2004  
**TYPE OF HOE:** Case 580 Super L Rubber tire backhoe  
**DEPTH TO GROUND WATER (ft):** 5

**LOGGED BY:** DPM  
**GROUND ELEVATION (ft):** 4420 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (SI)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td>0.0' - 0.5': CLAYEY SAND reddish-brown, slightly moist, loose, with estimated 35% medium plasticity fines and 65% fine sand. Soil consists of predominantly organic material.</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>0.5' - 1.2': SANDY LEAN CLAY dark brown, slightly moist, firm, with estimated 55-60% medium plasticity fines and 40-45% fine sand. Abundant roots encountered.</td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>1.2' - 2.5': SANDY LEAN CLAY light brown and grayish-brown, slightly moist, stiff, with estimated 60-65% medium plasticity fines and 35-40% fine to medium sand. Color darkens with depth from grade.</td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>2.5' - 3.0': GRAVELLY LEAN CLAY with SAND grey, moist, very stiff, with estimated 55% medium plasticity fines, 15% fine to medium sand, and 30% fine to coarse subangular gravel. Rare small subangular cobbles up to 4-inches encountered.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>CL</td>
<td>3.0' - 5.5': SANDY LEAN CLAY grey, moist to wet, soft, with, estimated 65% medium plasticity fines, 35% fine sand, and trace fine subangular gravel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td>5.5' - 7.0': CLAYEY SAND grey, wet, dense, with estimated 35-40% medium plasticity fines and 60-65% fine to coarse sand. Hole caving at 6.5 feet below grade.</td>
</tr>
</tbody>
</table>

---

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Reno, Nevada

**PROJECT NO.:** 0199-08-1  
**PLATE:** 2g  
**SHEET:** 1 of 1
## TEST PIT LOG

**TEST PIT NO.:** TP-05  
**DATE:** 6/10/2004

**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe

**DEPTH TO GROUND WATER (ft):** 4.5

**DEPTH TO BOTTOM (ft):**

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (si)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USGS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5% GRAB</td>
<td>&gt;5.0</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0' - 1.0': SILTY SAND brown, slightly moist, medium dense, with estimated 15% non-plastic fines and 85% fine to coarse sand with abundant roots.</td>
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</tr>
<tr>
<td>1.0' - 2.5': SILTY, CLAYEY SAND brown, slightly moist, medium dense, with estimated 30-35% medium plasticity fines and 65-70% fine to coarse sand. Soil sample submitted for chemical analysis.</td>
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<tr>
<td>2.5' - 3.5': SILTY SAND brown, moist, medium dense, with estimated 15% non-plastic fines and 85% fine to coarse sand.</td>
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</tr>
<tr>
<td>3.5' - 3.9': SANDY Silt light brown, moist, hard, with estimated 65% low plasticity fines and 35% fine to coarse sand. Strong cementation.</td>
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</tr>
<tr>
<td>3.9' - 4.5': POORLY GRADED SAND brown, very moist, loose, with estimated trace non-plastic fines, 100% fine to coarse sand, and trace fine subrounded gravel.</td>
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</tr>
<tr>
<td>4.5' - 6.5': POORLY GRADED SAND with Silt grey-green, wet; loose, with estimated 10% non-plastic fines and 90% fine to coarse sand.</td>
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</tr>
<tr>
<td>6.5' - 7.5': SANDY Silt grey, wet, hard, with estimated 60% low plasticity fines and 40% fine sand. Layer is strongly cemented and estimated from tailings.</td>
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<tr>
<td>7.5' - 9.0': POORLY GRADED SAND grey, wet, loose, with estimated trace non-plastic fines and 100% fine to coarse sand. Estimated from tailings.</td>
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</tr>
</tbody>
</table>

Located in abandoned pasture.

---

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Reno, Nevada

---

PROJECT NO.: 0199-08-1  
PLATE: 2

SHEET 1 OF 1
TEST PIT NO.: TP-06

DATE: 6/15/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTI-0TO GROUND WATER (ft): 9.2

LOGGED BY: DPM

GROUND ELEVATION (ft): 4430 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>USC'S SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<tr>
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<td>C</td>
<td>GRAB</td>
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<tr>
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<td>GRAB</td>
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</tr>
</tbody>
</table>

0.0' - 0.7': POORLY GRADED SAND with SILT brown, dry, loose, with estimated 10-12% non-plastic fines, 88-90% fine to coarse sand, and trace fine subrounded gravel. Abundant roots encountered.

0.7' - 2.3': POORLY GRADED SAND brown, slightly moist, loose, with estimated trace non-plastic fines, 100% fine to coarse sand, and trace fine subrounded gravel.

2.3' - 3.7': SANDY LEAN CLAY black and dark brown, slightly moist, medium stiff, with estimated 70% medium plasticity fines and 30% fine sand. Interbedded thin seams of silty soils near 3.5 feet below grade.

3.7' - 4.0': SANDY SILT reddish-brown, slightly moist, stiff, with estimated 50% low plasticity fines and 50% fine sand. Weakly cemented, with friable texture.

4.0' - 4.7': SILTY SAND light brown, slightly moist, medium dense, with estimated 30-40% low plasticity fines and 60-70% fine to medium sand. Fines decrease with depth from grade.

4.7' - 6.0': POORLY GRADED SAND with SILT light brown, slightly moist, medium dense, with estimated 10% non-plastic to low plasticity fines, 90% fine to coarse sand, and trace fine sub-rounded gravel.

6.0' - 7.0': SANDY LEAN CLAY dark brown and grey, slightly moist, medium stiff, with estimated 50% low to medium plasticity fines and 50% fine sand. Estimated from tailings.

7.0' - 14.6': SILTY SAND brown and grey-green, moist to wet, medium dense, with 20-40% low plasticity fines and 60-80% fine to coarse sand. Layer is interbedded and estimated from tailings.

Located 146 feet north of fence line.

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PROJECT NO.: 0199-08-1
PLATE: 21
SHEET 1 OF 2
**TEST PIT LOG**

**TEST PIT NO.:** TP-06                      **DATE:** 6/15/2004

**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe  **DEPTH TO GROUND WATER (ft):** 9.2

**LOGGED BY:** DPM                      **GROUND ELEVATION (ft):** 4430 (Topo)

---

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>-- Install slotted PVC pipe to observe the ground water table elevation. Measured ground water table on 6/17/04 is 9.2 feet below the ground surface.</td>
</tr>
</tbody>
</table>

Located 146 feet north of fence line.

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Centex Homes  
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Reno, Nevada.

**PROJECT NO.:** 0199-08-1  
**PLATE:** 2j  
**SHEET 2 OF 2**
## TEST PIT LOG

**TEST PIT NO.:** TP-07  
**DATE:** 6/14/2004  
**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe  
**LOGGED BY:** TWJ  
**DEPTH TO GROUND WATER (ft):** NE  
**GROUND ELEVATION (ft):** 4448 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (RS)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| A          | GRAB        |                   |              | SM               | 0.0' - 1.0': SILTY SAND grayish brown, dry to slightly moist, loose from 0-0.15' and dense from 0.15-1.0', with estimated 15% non-plastic fines and 85% fine to medium sand. With trace roots to 0.3" in diameter.  
1.0' - 3.0': POORLY GRADED GRAVEL WITH CLAY AND SAND dark brown, moist, very dense, with estimated 10% low to medium plastic fines, 30% fine to coarse sand, and 60% subrounded to subangular gravel to 2-1/2". With subrounded to subangular cobbles to 1' that make up to 40% of the total soil mass. With subrounded boulders to 3' that make up to 10% of the total soil mass. With trace rootlets. Moderately difficult to excavate. POORLY GRADED GRAVEL WITH SAND brown, slightly moist, dense, with estimated 5% non-plastic fines, 15% fine to coarse sand, and 80% subrounded gravel to 2-1/2".  
3.4' - 4.1': POORLY GRADED GRAVEL Hardpan light whitish gray, slightly moist, dry, with estimated <5% non-plastic fines, 10% fine to coarse sand, and 85% angular to subangular gravel to 3". With angular cobbles to 6" that make up to 5% of the total soil mass. With strong calcium carbonate cement. Material is very difficult to excavate. Refusal at 4.1 feet. Trench excavation is 60 feet long. No fault observed. |
| B          | GRAB        |                   |              | GP-GC            | 0.0' - 1.0': SILTY SAND grayish brown, dry to slightly moist, loose from 0-0.15' and dense from 0.15-1.0', with estimated 15% non-plastic fines and 85% fine to medium sand. With trace roots to 0.3" in diameter.  
1.0' - 3.0': POORLY GRADED GRAVEL WITH CLAY AND SAND dark brown, moist, very dense, with estimated 10% low to medium plastic fines, 30% fine to coarse sand, and 60% subrounded to subangular gravel to 2-1/2". With subrounded to subangular cobbles to 1' that make up to 40% of the total soil mass. With subrounded boulders to 3' that make up to 10% of the total soil mass. With trace rootlets. Moderately difficult to excavate. POORLY GRADED GRAVEL WITH SAND brown, slightly moist, dense, with estimated 5% non-plastic fines, 15% fine to coarse sand, and 80% subrounded gravel to 2-1/2".  
3.4' - 4.1': POORLY GRADED GRAVEL Hardpan light whitish gray, slightly moist, dry, with estimated <5% non-plastic fines, 10% fine to coarse sand, and 85% angular to subangular gravel to 3". With angular cobbles to 6" that make up to 5% of the total soil mass. With strong calcium carbonate cement. Material is very difficult to excavate. Refusal at 4.1 feet. Trench excavation is 60 feet long. No fault observed. |
| C          | GRAB        |                   |              | GP              | 0.0' - 1.0': SILTY SAND grayish brown, dry to slightly moist, loose from 0-0.15' and dense from 0.15-1.0', with estimated 15% non-plastic fines and 85% fine to medium sand. With trace roots to 0.3" in diameter.  
1.0' - 3.0': POORLY GRADED GRAVEL WITH CLAY AND SAND dark brown, moist, very dense, with estimated 10% low to medium plastic fines, 30% fine to coarse sand, and 60% subrounded to subangular gravel to 2-1/2". With subrounded to subangular cobbles to 1' that make up to 40% of the total soil mass. With subrounded boulders to 3' that make up to 10% of the total soil mass. With trace rootlets. Moderately difficult to excavate. POORLY GRADED GRAVEL WITH SAND brown, slightly moist, dense, with estimated 5% non-plastic fines, 15% fine to coarse sand, and 80% subrounded gravel to 2-1/2".  
3.4' - 4.1': POORLY GRADED GRAVEL Hardpan light whitish gray, slightly moist, dry, with estimated <5% non-plastic fines, 10% fine to coarse sand, and 85% angular to subangular gravel to 3". With angular cobbles to 6" that make up to 5% of the total soil mass. With strong calcium carbonate cement. Material is very difficult to excavate. Refusal at 4.1 feet. Trench excavation is 60 feet long. No fault observed. |
| D          | GRAB        |                   |              | GP              | 0.0' - 1.0': SILTY SAND grayish brown, dry to slightly moist, loose from 0-0.15' and dense from 0.15-1.0', with estimated 15% non-plastic fines and 85% fine to medium sand. With trace roots to 0.3" in diameter.  
1.0' - 3.0': POORLY GRADED GRAVEL WITH CLAY AND SAND dark brown, moist, very dense, with estimated 10% low to medium plastic fines, 30% fine to coarse sand, and 60% subrounded to subangular gravel to 2-1/2". With subrounded to subangular cobbles to 1' that make up to 40% of the total soil mass. With subrounded boulders to 3' that make up to 10% of the total soil mass. With trace rootlets. Moderately difficult to excavate. POORLY GRADED GRAVEL WITH SAND brown, slightly moist, dense, with estimated 5% non-plastic fines, 15% fine to coarse sand, and 80% subrounded gravel to 2-1/2".  
3.4' - 4.1': POORLY GRADED GRAVEL Hardpan light whitish gray, slightly moist, dry, with estimated <5% non-plastic fines, 10% fine to coarse sand, and 85% angular to subangular gravel to 3". With angular cobbles to 6" that make up to 5% of the total soil mass. With strong calcium carbonate cement. Material is very difficult to excavate. Refusal at 4.1 feet. Trench excavation is 60 feet long. No fault observed. |

Located on native soil window within Bella Vista Pit at 50 feet north of mine road.

---

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**Centex Homes**  
Bella Vista Ranch  
Reno, Nevada

**PROJECT NO.:** 0199-08-1  
**PLATE:** 2j  
**SHEET 1 OF 1**
**TEST PIT NO.:** TP-08  
**DATE:** 6/10/2004  
**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe  
**DEPTH TO GROUND WATER (ft):** NE  
**GROUND ELEVATION (ft):** 4432 (Topo)  

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0' - 0.5': <strong>TOPSOIL</strong> brown, dry, loose, with abundant organic material.</td>
</tr>
<tr>
<td>B</td>
<td>GRAB 3.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.5' - 1.0': <strong>CLAYEY SAND</strong> black, slightly moist, coarse, with estimated 20% medium plasticity fines and 80% fine to coarse sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0' - 3.0': <strong>POORLY GRADED SAND WITH SILT</strong> brown, slightly moist, loose, with estimated trace non-plastic fines, 95% fine to coarse sand, and 5% fine rounded gravel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.0' - 5.0': <strong>POORLY GRADED SAND WITH SILT</strong> light brown and brown, slightly moist, medium dense, with estimated 5% non-plastic fines, 95% fine to coarse sand, and trace fine rounded gravel. Thin seam of silty sand encountered at top of layer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.0' - 6.5': <strong>CLAYEY SAND</strong> black, moist, medium dense, with estimated 45% medium plasticity fines and 55% fine sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.5' - 11.0': <strong>CLAYEY SAND</strong> black and brown, moist, medium dense, with estimated 25-35% low to medium plasticity fines and 65-75% fine to coarse sand. Alternating interbedded layers of silty sand and clayey sand estimated from tailings.</td>
</tr>
</tbody>
</table>

Abandoned pasture with brush to 1 foot in height.

---

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**Centex Homes**  
Bella Vista Ranch  
Reno, Nevada

**PROJECT NO.:** 0199-08-1  
**PLATE:** 2k  
**SHEET 1 OF 1**
TEST PIT LOG

**TEST PIT NO.:** TP-09  
**DATE:** 6/15/2004  
**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe  
**LOGGED BY:** DPM

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (in)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USC'S SYMBOL</th>
<th>LOADING</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td>0.0 - 0.7</td>
<td>SC</td>
<td>CL</td>
<td>0.0 - 0.7</td>
<td>CLAYEY SAND</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td>0.7 - 1.2</td>
<td>SC-SM</td>
<td>SP-SM</td>
<td>0.7 - 1.2</td>
<td>SANDY LEAN CLAY</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td>1.2 - 2.2</td>
<td>SC</td>
<td>SP-SM</td>
<td>1.2 - 2.2</td>
<td>SILTY, CLAYEY SAND</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td>2.2 - 3.0</td>
<td>SC</td>
<td>SP-SM</td>
<td>2.2 - 3.0</td>
<td>POORLY GRADED SAND WITH SILT</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>GRAB</td>
<td>3.0 - 4.0</td>
<td>SC</td>
<td>SP-SM</td>
<td>3.0 - 4.0</td>
<td>CLAYEY SAND</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>GRAB</td>
<td>4.0 - 5.5</td>
<td>SC</td>
<td>SP-SM</td>
<td>4.0 - 5.5</td>
<td>CLAYEY SAND</td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION:**

- **0.0' - 0.7':** CLAYEY SAND brown, dry to slightly moist, loose to medium dense, with estimated 40% medium plasticity fines and 60% fine sand. Very abundant organic material and roots present in soil.
- **0.7' - 1.2':** SANDY LEAN CLAY light brown, slightly moist, firm, with estimated 55-60% medium plasticity fines and 40-45% fine sand. Very abundant organic material in soil. Soil sample submitted for chemical analysis.
- **1.2' - 2.2':** SILTY, CLAYEY SAND brown, moist, loose, with 21% low to medium plasticity fines and 80% fine to coarse sand.
- **2.2' - 3.0':** POORLY GRADED SAND with SILT brown, moist, loose, with estimated 5% non-plastic fines and 80% fine to coarse sand.
- **3.0' - 4.0':** CLAYEY SAND brown, very moist, loose to medium dense, with estimated 20% medium plasticity fines, 75% fine to coarse sand, and 5% fine subrounded gravel.
- **4.0' - 5.5':** CLAYEY SAND light brown, wet, medium dense, with estimated 45% medium plasticity fines and 55% fine sand.
- **5.5' - 10.0':** SILTY SAND grey, wet, loose, with estimated 15% low plasticity fines, 85% fine to coarse sand, and trace fine subrounded gravel.

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**Located 165 feet east of active irrigation ditch.**

-- Install slotted PVC pipe to observe the ground water table elevation. Measured ground water table on 6/17/04 is 4.0 feet below the ground surface.

---

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**Centex Homes**  
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**PROJECT NO.:** 0199-08-1  
**PLATE:** 21  
**SHEET 1 OF 1**
# TEST PIT LOG

**Test Pit No.:** TP-10  
**Date:** 6/14/2004

**Type of Hoe:** Case 580 Super L Rubber tire backhoe

**Logged By:** TWJ

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>Lithology Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td>0.0 - 0.6'</td>
<td></td>
<td>CL-ML</td>
<td>0.0 - 0.6'</td>
<td>SILTY CLAY</td>
<td>Grayish brown, dry to slightly moist, firm, with estimated 90% low plastic fines and 10% fine sand. With strong roots.</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td>&gt;4.5</td>
<td></td>
<td>CL</td>
<td>&gt;4.5</td>
<td>SANDY LEAN CLAY</td>
<td>Dark brown, moist, very hard, with estimated 70% low plastic fines and 30% fine to medium sand. With trace rootlets. Pocket penetrometer is &gt;4.5 tfs.</td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td>4.0 - 4.5</td>
<td></td>
<td>CL</td>
<td>4.0 - 4.5</td>
<td>LEAN CLAY WITH SAND</td>
<td>Light brown, moist, hard, with estimated 85% low plastic fines and 15% fine to medium sand. With trace rootlets.</td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td>&gt;4.5</td>
<td></td>
<td>SP</td>
<td>&gt;4.5</td>
<td>POORLY GRADED SAND</td>
<td>Brown, very moist, dense, with estimated &lt;5% non-plastic fines and 95% to coarse sand. Interbedded with Clayey Sand with estimated 15% low plastic fines and 85% fine to coarse sand. With trace rootlets.</td>
</tr>
<tr>
<td>E</td>
<td>GRAB</td>
<td>&gt;4.5</td>
<td></td>
<td>CL</td>
<td>&gt;4.5</td>
<td>LEAN CLAY</td>
<td>Dark brown to brown, very moist, very hard, with estimated 90% medium plastic fines and 10% fine sand. Pocket penetrometer = &gt;4.5 tfs.</td>
</tr>
<tr>
<td>F</td>
<td>GRAB</td>
<td>9.5 - 10.0'</td>
<td></td>
<td>CL</td>
<td>9.5 - 10.0</td>
<td>POORLY GRADED SAND</td>
<td>Brown, very moist, medium dense, with estimated &lt;5% non-plastic fines and 95% fine to coarse sand. No seeping water.</td>
</tr>
<tr>
<td>G</td>
<td>GRAB</td>
<td>10.0 - 11.5'</td>
<td></td>
<td>CL</td>
<td>10.0 - 11.5</td>
<td>LEAN CLAY</td>
<td>Dark grayish green, very moist, very hard, with estimated 95% medium plastic fines and 5% fine sand.</td>
</tr>
</tbody>
</table>

Install 3" diameter PVC pipe to observe the ground water table elevation. Ground water table measured at deeper than 10.0 feet below the ground surface on 6/17/04.

Located 66 feet east of fence line.

---

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Reno, Nevada

---

**Project No.:** 0199-08-1  
**Plate:** 2m  
**Sheet:** 1 of 1
### TEST PIT LOG

**TEST PIT NO.:** TP-11  
**DATE:** 6/10/2004  
**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe  
**DEPTH TO GROUND WATER (ft):** 9.5  
**GROUND ELEVATION (ft):** 4431.5 (Topo)

**LOGGED BY:** DPM

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>USCS SYMBOL</th>
<th>USCS SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION**

0.0' - 1.5': **CLAYEY SAND** black and dark brown, slightly moist, loose, with estimated 40-45% medium plasticity fines and 55-60% fine sand. Dense rootlets encountered.

1.5' - 2.7': **SILTY SAND** brown, moist, medium dense, with estimated 12-15% low plasticity fines and 85-88% fine to coarse sand with roots.

2.7' - 3.0': **CLAYEY SAND** dark brown, moist, medium dense, with estimated 35% medium plasticity fines and 65% fine to coarse sand.

3.0' - 3.5': **POORLY GRADED SAND** brown, moist, medium dense, with estimated trace non-plastic fines and 100% fine to coarse sand.

3.5' - 4.5': **SILTY, CLAYEY SAND** brown, moist, medium dense, with estimated 35-45% low to medium plasticity fines and 55-65% fine to coarse sand.

4.5' - 6.5': **SANDY LEAN CLAY** dark brown, moist, firm to stiff, with estimated 50% medium plasticity fines and 50% fine sand.

6.5' - 10.0': **CLAYEY SAND** brown and dark brown, moist to wet, medium dense, with estimated 20-35% medium plasticity fines and 65-80% fine to coarse sands in interbedded layers. Estimated from tailings.

Abandoned pasture with sage to 3 foot in height.

---

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**Centex Homes**  
Bella Vista Ranch  
Reno, Nevada

**PROJECT NO.:** 0199-08-1  
**PLATE:** 2h  
**SHEET 1 OF 1**
TEST PIT NO.: TP-12
DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe
DEPTH TO GROUND WATER (ft): >6.5

LOGGED BY: TWJ
GROUND ELEVATION (ft): 4455 (Topo)

DEPTH TO GROUND WATER (ft): >6.5

DESCRIPTION

0.0' - 0.9': **SILTY SAND** grayish brown, dry from 0-0.1' and slightly moist from 0.1-0.9', dense, with estimated 20% non-plastic fines, 68% fine to medium sand, and 12% subrounded gravel to 2". With trace roots to 1/2"

0.9' - 1.7': **POORLY GRADED GRAVEL WITH CLAY AND SAND** dark brown, moist, very dense, with estimated 5% medium plastic fines, 40% fine to coarse sand, and 55% subangular gravel to 3". With subangular cobbles to 1". With trace gravel. **POORLY GRADED GRAVEL** light whitish gray, dry to slightly moist, very dense, with estimated <5% non-plastic fines, 10% fine to coarse sand, and 85% subangular to subrounded gravel to 3". With trace subangular cobbles to 7". With strong calcium carbonate cement. Gravel and cobbles consist of black basalt porphyry.

2.7' - 4.8': **POORLY GRADED GRAVEL WITH SILT AND SAND** light brown, slightly moist, very dense, with estimated 5% non-plastic fines, 30% fine to coarse sand, and 65% subangular to subrounded gravel to 3". With subrounded to subangular cobbles to 8" that make up to 15% of the total soil mass. With trace calcium carbonate filaments and coatings to 4". **POORLY GRADED SAND WITH GRAVEL** light brown, slightly moist, very dense, with estimated <5% non-plastic fines, 80% fine to coarse sand, and 15% subrounded to subangular gravel to 3". With subrounded cobbles to 6" that make up to 5% of the total soil mass. Refusal at 6.5 feet.

Located 150 feet south of open pit boundary and 280 feet northeast of dirt road.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1
PLATE: 2o
SHEET 1 OF 1
## TEST PIT LOG

**TEST PIT NO.:** TP-13  
**DATE:** 6/10/2004  
**LOGGED BY:** DPM  
**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe  
**DEPTH TO GROUND WATER (ft):** NE  
**GROUND ELEVATION (ft):** 4441.5 (Topo)

### SAMPLE NO. | PENETROMETER (ds) | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION
---|---|---|---|---|---|---|---
A | GRAB | 0.0'-0.4': TOPSOIL  
0.4'-1.0': POORLY GRADED SAND light brown, dry, dense, with estimated trace non-plastic fines and 100% fine to coarse sand with abundant roots  
1.0'-1.5': SILTY SAND light brown, dry, dense, with estimated 30% non-plastic fines and 70% fine sand with roots  
1.5'-2.3': POORLY GRADED SAND reddish-brown and brown, dry, loose, with estimated trace non-plastic fines and 100% fine to coarse sand with abundant roots  
2.3'-3.0': SANDY SILT light brown and black, dry, very stiff, with estimated 55-60% low plasticity fines and 40-45% fine sand  
3.0'-3.5': POORLY GRADED SAND brown, dry, dense, with estimated 5% non-plastic fines and 95% fine to coarse sand with mica  
3.5'-5.0': SANDY LEAN CLAY light brown, dry, very stiff with 59% low plastic fines and 41% fine to medium sand  
5.0'-6.0': POORLY GRADED SAND brown, dry to slightly moist, loose, with estimated trace non-plastic fines and 100% fine to coarse sand with mica  
6.0'-7.0': SANDY SILT brown, moist, stiff, with estimated 55% low plasticity fines and 45% fine sand  
7.0'-12.0': CLAYEY SAND brown and grey, moist, medium dense, with estimated 35-45% medium plasticity fines and 55-65% fine to coarse sand. Estimated from tailings.

---

Abandoned pasture with dense brush to 3 foot in height.

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---

Centex Homes  
Bella Vista Ranch  
Reno, Nevada

---

**PROJECT NO.:**  
0199-08-1  
**PLATE:**  
2p  
**SHEET 1 OF 1**
**TEST PIT LOG**

**TYPE OF HOE:** Case 580 Super L Rubber tire back hoe  
**DATE:** 6/15/2004  
**DEPTH TO GROUND WATER (ft):** 6.5  
**GROUND ELEVATION (ft):** 4432 (Topo)

---

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (in)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>0.0' - 1.0': SANDY LEAN CLAY</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td></td>
<td>6.1</td>
<td>NP</td>
<td></td>
<td></td>
<td>SC</td>
<td>1.0' - 2.0': CLAYEY SAND black and brown, slightly moist, medium dense, with estimated 40% medium plasticity fines and 60% fine sand. Abundant organics and interbedded clean sand and silty sand seams encountered.</td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td>2.0' - 2.7': SILTY SAND brown, slightly moist, medium dense, with 13% non-plastic fines and 87% fine to medium sand with mica. Fines percentage decreases with depth from grade. Soil sample submitted for chemical analysis.</td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>2.7' - 3.0': CLAYEY SAND black, slightly moist, medium dense, with estimated 45% medium plasticity fines and 55% fine sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td>3.5' - 3.7': CLAYEY SAND light brown, slightly moist, medium dense, with estimated 25% medium plasticity fines and 75% fine to coarse sand.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>3.7' - 6.0': SANDY LEAN CLAY dark brown, moist, stiff, with estimated 65% low to medium plasticity fines and 35% fine sand.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td>6.0' - 6.7': SILTY SAND brown, moister, medium dense, with estimated 15% low plasticity fines and 85% fine to coarse sand.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td>6.7' - 8.0': SANDY LEAN CLAY brown, moist, firm, with estimated 75% medium plasticity fines and 25% fine sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td>8.0' - 13.0': SILTY, CLAYEY SAND brown, grey, and bluish-green, moist, medium dense, with estimated 25-40% low to medium plasticity fines and 60-75% fine to coarse sand. Interbedded layers of silty sands and clayey sands estimated from tailings.</td>
</tr>
</tbody>
</table>

---

Located 50 feet south of fence line.

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Reno, Nevada  

---

**PROJECT NO.:** 0199-08-1  
**PLATE:** 2q  
**SHEET:** 1 OF 1
TEST PIT LOG

TEST PIT NO.: TP-15
DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe
DEPTH TO GROUND WATER (ft): 11

LOGGED BY: DPM
GROUND ELEVATION (ft): 4441 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USGS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td></td>
<td>0.0' - 0.5': CLAYEY SAND brown, dry, dense, with estimated 35-40% medium plasticity fines and 60-65% fine to coarse sand. Very abundant roots and organics encountered.</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td>4.5</td>
<td>SC-SM</td>
<td></td>
<td>0.5' - 1.5': POORLY GRADED SAND brown, slightly moist, loose, with estimated trace non-plastic fines and 100% fine to coarse sand.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>ML</td>
<td></td>
<td>1.5' - 3.0': SILTY, CLAYEY SAND dark brown, slightly moist, medium dense, with estimated 35-40% low to medium plasticity fines and 60-65% fine to coarse sand.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>SP</td>
<td></td>
<td>3.0' - 3.5': SANDY SILT brown, moist, stiff, with estimated 55% low plasticity fines and 45% fine sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP</td>
<td></td>
<td>3.5' - 4.0': POORLY GRADED SAND brown, moist, medium dense, with estimated trace non-plastic fines and 100% fine to coarse sand.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>4.0' - 4.5': SANDY SILT brown, moist, stiff, with estimated 55% low plasticity fines and 45% fine sand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>4.5' - 5.0': POORLY GRADED SAND brown, moist, medium dense, with estimated trace non-plastic fines and 100% fine to coarse sand.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>CH</td>
<td></td>
<td>5.0' - 6.0': POORLY GRADED SAND with SILT brown, moist, medium dense, with estimated 5-10% non-plastic fines and 90-95% fine to coarse sand. Estimated from tailings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SC</td>
<td></td>
<td>6.0' - 7.0': SANDY FAT CLAY black, moist, stiff, with estimated 70% medium to high plasticity fines and 30% fine sand. Estimated from tailings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CH</td>
<td></td>
<td>7.0' - 9.0': CLAYEY SAND brown, moist, medium dense, with estimated 30% medium plasticity fines and 70% fine to coarse sand. Estimated from tailings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>9.0' - 9.5': SANDY FAT CLAY black, moist, stiff, with estimated 70% medium to high plasticity fines and 30% fine sand. Estimated from tailings.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>9.5' - 12.0': POORLY GRADED SAND with SILT brown, moist to wet, medium dense, with estimated 5-10% low plasticity fines and 90-95% fine to coarse sand. Estimated from tailings.</td>
</tr>
</tbody>
</table>

Located 500 feet east of Steamboat ditch with 1 foot high dense brush.

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PROJECT NO.: 0199-08-1
PLATE: 2r
SHEET 1 OF 1
TEST PIT NO.: TP-16

DATE: 6/10/2004

DEPTH TO GROUND WATER (ft): 2.7

GROUND ELEVATION (ft): 4434 (Topo)

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

LOGGED BY: DPM

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>TEST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td>0.0' - 0.5': TOPSOIL</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td>0.5' - 1.0': SANDY LEAN CLAY light brown, moist, firm, with estimated 60-70% medium plasticity fines and 30-40% fine sand.</td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td>1.0' - 2.2': SANDY LEAN CLAY light brown, moist, soft, with estimated 60% low to medium plasticity fines and 40% fine sand.</td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td>2.2' - 2.8': SANDY LEAN CLAY brown, moist to wet, soft, with estimated 50% medium plasticity fines and 50% fine sand.</td>
</tr>
<tr>
<td>E</td>
<td>GRAB</td>
<td>2.8' - 4.0': SANDY LEAN CLAY light brown and brown, wet, soft, with estimated 50% medium plasticity fines, 40% fine to coarse sand, and 10% fine to coarse round gravel. With trace rounded cobbles to 8”. Water sample collected on 6/17/04 and submitted for chemical analysis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.0' - 4.5': CLAYEY SAND brown, wet, soft, with estimated 35-45% medium plasticity fines, 55-65% fine to coarse sand, and trace fine to coarse rounded gravel. Estimated from tailings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.5' - 7.0': SILTY SAND grey-brown, wet, loose to very loose, with estimated 25% low plasticity fines, 70% fine to coarse sand, and 5% rounded fine to coarse gravel. Occasional rounded cobbles up to 8-inches in diameter comprise 5% total soil mass.</td>
</tr>
</tbody>
</table>

-- Install slotted PVC pipe to observe the ground water table elevation. The measured ground water table on 6/17/04 is 2.7 feet below the ground surface.

Located west of Mira Loma Road and gun club.

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PROJECT NO.: 0199-08-1

PLATE: 2s

SHEET 1 OF 1
TEST PIT NO.: TP-17  
DATE: 6/14/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe  
DEPTH TO GROUND WATER (ft): 5.1

LOGGED BY: TWJ  
GROUND ELEVATION (ft): 4444 (Topo)

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (psi)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/B GRAB</td>
<td></td>
<td>CL</td>
<td></td>
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<td></td>
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<td>CL</td>
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<td></td>
<td></td>
<td>SM</td>
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<td></td>
<td></td>
<td>SP</td>
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<tr>
<td></td>
<td></td>
<td>SC-SM</td>
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</tr>
</tbody>
</table>

**DESCRIPTION**

0.0' - 0.6': **LEAN CLAY** brown, slightly moist, firm, with estimated 90% low plastic fines and 10% fine sand. With strong roots and grass.

0.6' - 1.3': **LEAN CLAY WITH SAND** brown, slightly moist, very stiff, with estimated 85% low plastic fines and 15% fine sand. With weak roots. Pocket penetrometer = 3.0-3.5 tsf.

1.3' - 3.1': **SILTY SAND** grayish brown to brown, moist, dense, with estimated 20% non-plastic fines and 80% fine to medium sand. With trace rootlets. A one-inch thick layer of dark brown Clayey Sand occurs at 2.0 feet with 15% medium plastic fines and 85% fine to medium sand.

3.1' - 4.7': **POORLY GRADED SAND** brown, moist, dense, with estimated <5% non-plastic fines and 95% fine to coarse sand. With trace rootlets. One 0.5" thick Clayey Sand layer at 3.4 feet with 15% medium plastic fines and 85% fine to medium sand.

4.7' - 5.9': **SILTY SAND** dark brown, very moist to wet, dense, with estimated 15% non-plastic fines and 85% fine to medium sand. With trace rootlets.

5.9' - 7.8': **SILTY, CLAYEY SAND** mottled from dark brown to dark green, wet, dense, with estimated 25% non-plastic to low plastic fines and 75% fine to medium sand. Water is minorly seeping at 7.8 feet at approximately 1 gallon per minute.

7.8' - 10.4': **POORLY GRADED SAND** grayish brown, wet, dense, with estimated <5% non-plastic fines, 85% fine to coarse sand, and 10% rounded gravel to 1-1/2".

- Soil sample from 0-1.3 feet submitted for chemical analysis.
- Install 3" diameter PVC pipe to observe the ground water table elevation. Ground water table measured at 5.1 feet below the ground surface on 6/17/04.

Located 200 feet west of Steamboat Creek, dense grass to 3 feet tall.

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PROJECT NO.: 0199-08-1
PLATE: 2t
SHEET 1 OF 1
TEST PIT LOG

TEST PIT NO.: TP-18

DATE: 6/15/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 4.2

GROUND ELEVATION (ft): 4441 (Topo)

LOGGED BY: DPM

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>SOIL TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td>30.1</td>
<td>16</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

DESCRIPTION

0.0' - 0.5': TOPSOIL

0.5' - 1.0': POORLY GRADED SAND brown, slightly moist, loose, with estimated trace non-plastic fines and 100% medium to coarse sand with roots.

1.0' - 3.0': SANDY LEAN CLAY brown, moist, medium dense, with 59% medium plasticity fines and 41% fine sand.

3.0' - 4.0': SANDY LEAN CLAY light brown, moist, stiff, with estimated 65% low to medium plasticity fines and 35% fine sand.

4.0' - 7.0': SILTY, CLAYEY SAND brown, very moist to wet, loose, with estimated 35% low to medium plasticity fines and 65% fine to medium sand.

7.0' - 10.0': SILTY SAND grey-green-blue, wet, loose to medium dense, with estimated 30% low plasticity fines and 70% fine to coarse sand.

Install slotted PVC pipe to observe the ground water table elevation. The measured ground water table on 6/17/04 is 4.2 feet below the ground surface.

Located 150 feet east of flowing creek in southeast corner of parcel.

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Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2u

SHEET 1 OF 1
TEST PIT LOG

TEST PIT NO.: TP-19

DATE: 6/15/2004

DEPTH TO GROUND WATER (ft): 3.0

GROUND ELEVATION (ft): 444.5 (Topo)

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

LOGGED BY: DPM

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USC'S SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td>4.0 - 7.0</td>
<td>SC</td>
<td>CLAYEY SAND</td>
<td>dark brown, slightly moist, loose, with estimated 45% low to medium plasticity fines and 55% fine sand.</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td>42.2</td>
<td>12</td>
<td></td>
<td>3.0 - 5.0</td>
<td>ML</td>
<td>SANDY LEAN CLAY</td>
<td>grey and black, moist, soft, with estimated 60-70% medium plasticity fines and 30-40% fine sand. Layer is interbedded with alternating colors.</td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td>3.5 - 4.0</td>
<td>SC</td>
<td>CLAYEY SAND with GRAVEL</td>
<td>brown, wet, loose, with estimated 40% low to medium plasticity fines, 45% fine to coarse sand, and 15% fine to coarse angular gravel. Subangular fine to coarse cobbles up to 8&quot; comprise 5% of the total soil mass.</td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td>4.0 - 5.0</td>
<td>SM</td>
<td>SANDY SILT</td>
<td>brown, wet, soft, with estimated 60% low plasticity fines, 40% fine sand, and trace fine subangular gravel. Hole caving at 6 feet below grade.</td>
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<tr>
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<td>5.0 - 7.0</td>
<td>SM</td>
<td>SILTY SAND</td>
<td>grey, wet, loose, with estimated 15-20% low plasticity fines, 70-75% fine to coarse sand, and 10% fine subrounded gravel.</td>
</tr>
</tbody>
</table>

--- Install a slotted PVC pipe to observe the ground water table elevation. The measured ground water table on 6/17/04 is 3.0 feet below the ground surface.
## TEST PIT LOG

<table>
<thead>
<tr>
<th>SAMPLE NO</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>USCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>0.0' - 1.2': Silty Sand</td>
<td>grayish brown, dry to slightly moist, loose, with estimated 15% non-plastic fines and 85% fine to medium sand. With strong roots to 1/2&quot; in diameter.</td>
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</tr>
<tr>
<td>1.2' - 2.1': Poorly Graded Gravel with Sand</td>
<td>grayish brown, slightly moist, dense, with estimated &lt;5% non-plastic fines, 25% fine to coarse sand, and 70% rounded to subangular gravel to 2-1/2&quot;. With some rootlets in upper 5&quot; of interval.</td>
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</tr>
<tr>
<td>2.1' - 3.4': Poorly Graded Sand with Silt</td>
<td>light brown to brown, moist, dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. A Silt layer 5&quot; thick (not sampled) occurs from 2.1'-2.45 feet with estimated 90% non-plastic fines and 10% fine-grained sand. Pocket penetrometer = 2.5 tsf. With some rootlets.</td>
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</tr>
<tr>
<td>3.4' - 4.7': Clayey Sand</td>
<td>grayish brown, moist, dense, with estimated 25% low to medium plastic fines and 75% fine to coarse sand. With trace rootlets.</td>
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</tr>
<tr>
<td>4.7' - 5.0': Lean Clay with Sand</td>
<td>dark grayish brown, moist-hard, with estimated 85% low to medium plastic fines and 15% fine sand. Poorly Graded Sand with Silt brown, very moist dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. With trace iron-oxide staining.</td>
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</tr>
<tr>
<td>6.1' - 6.4': Clayey Sand</td>
<td>dark brown, very moist, dense, with estimated 15% low plastic fines and 85% fine to coarse sand. Water sample collected on 6/17/04 and submitted for chemical analysis.</td>
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</tr>
<tr>
<td>6.4' - 8.0': Poorly Graded Sand</td>
<td>grayish brown, very moist to wet, medium dense, with estimated &lt;5% non-plastic fines and 95% fine to coarse sand. Moderate water seeping at 7.2 feet at approximately 1 gallon per minute.</td>
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</tr>
<tr>
<td>8.0' - 11.0': Sandy Lean Clay</td>
<td>modified from dark brown to dark green, wet, firm, with estimated 70% medium plastic fines and 30% fine to medium sand. Pocket penetrometer = 1.25-1.5 tsf.</td>
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</tr>
</tbody>
</table>

- Install 3" diameter PVC pipe to observe the ground water table elevation. Ground water table elevation measured at 6.2 feet below the surface on 6/17/04.
TEST PIT NO.: TP-21
DATE: 6/14/2004
TYPE OF HOE: Case 580 Super L Rubber tire back hoe
DEPTH TO GROUND WATER (ft): NE
GROUND ELEVATION (ft): 4450 (Topo)

LOGGED BY: TWJ

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>PENETROMETER (ft)</th>
<th>MOISTURE (%)</th>
<th>PLASTICITY INDEX</th>
<th>DEPTH (ft)</th>
<th>UCS SYMBOL</th>
<th>LITHOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td></td>
<td>0.0' - 1.0': Silty Sand grayish brown, dry, loose, with estimated 20% non-plastic fines, 75% fine to coarse sand, and 5% subangular to subrounded gravel to 1/4&quot;. With moderate rootlets.</td>
</tr>
<tr>
<td>B</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>1.0' - 3.7': Poorly Graded Sand with Silt and Gravel brown, slightly moist, dense, with estimated 10% non-plastic fines, 65% fine to coarse sand, and 25% subrounded gravel to 1-1/4&quot;. With trace white clay filaments.</td>
</tr>
<tr>
<td>C</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>3.7' - 5.3': Poorly Graded Sand with Silt brown, moist, very dense, with estimated 8% non-plastic fines and 92% fine to medium sand.</td>
</tr>
<tr>
<td>D</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM</td>
<td></td>
<td>5.3' - 7.0': Poorly Graded Sand with Silt and Gravel brown, moist, dense, with estimated 10% non-plastic fines, 65% fine to coarse sand, and 25% subrounded gravel to 1-1/2&quot;.</td>
</tr>
<tr>
<td>E</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP</td>
<td></td>
<td>7.0' - 9.5': Poorly Graded Sand grayish brown, moist, dense, with estimated &lt;5% non-plastic fines, 90% fine to coarse sand, and 5% subrounded gravel to 1&quot;.</td>
</tr>
<tr>
<td>F</td>
<td>GRAB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP</td>
<td></td>
<td>9.5' - 11.0': Poorly Graded Sand with Gravel brownish gray, very moist, very dense, with estimated &lt;5% non-plastic fines, 65% fine to coarse sand, and 30% subrounded gravel to 2&quot;.</td>
</tr>
</tbody>
</table>

Located 50 feet north of SE parcel corner. Test pit excavated on eastern side of barbed-wire fence.

Black Eagle Consulting, Inc.
1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
(775) 359-6600

Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1
PLATE: 2x
SHEET 1 OF 1
### Grain Size Distribution

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>USCS Classification</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Cc</th>
<th>Cu</th>
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<tbody>
<tr>
<td>TP-13</td>
<td>SANDY LEAN CLAY (CL)</td>
<td>35</td>
<td>24</td>
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<tr>
<td>TP-14</td>
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<th>D30</th>
<th>D10</th>
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<th>%Gravel</th>
<th>%Sand</th>
<th>%Silt</th>
<th>%Clay</th>
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<td>0.14</td>
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</tr>
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**Black Eagle Consulting, Inc.**

1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
Telephone: (775) 359-6600
Fax: (775) 359-7766

---

**Project:** Bella Vista Ranch  
**Location:** Reno, Nevada  
**Project Number:** 0199-08-1  
**Plate Number:** 4b
**ATTERBERG LIMITS RESULTS**

<table>
<thead>
<tr>
<th>Specimen Identification</th>
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<td>□ TP-02</td>
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<td>22</td>
<td>7</td>
<td>21 SILTY, CLAYEY SAND (SC-SM)</td>
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<tr>
<td>★ TP-10</td>
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<td>26</td>
<td>84 LEAN CLAY with SAND (CL)</td>
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<td>◦ TP-11</td>
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<td>NP</td>
<td>NP</td>
<td>NP</td>
<td>10 POORLY GRADED SAND with SILT (SP-SM)</td>
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<tr>
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<td>11</td>
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<td>20</td>
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<td>19</td>
<td>16</td>
<td>59 SANDY LEAN CLAY (CL)</td>
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<tr>
<td>◦ TP-19</td>
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<td>41</td>
<td>29</td>
<td>12</td>
<td>66 SANDY SILT (ML)</td>
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</table>

**Specimen Depth in Feet**

**PLASTICITY INDEX**

**LIQUID LIMIT**

---

Black Eagle Consulting, Inc.
1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
Telephone: (775) 359-6600
Fax: (775) 359-7766

Project: Bella Vista Ranch
Location: Reno, Nevada
Project Number: 0199-08-1 Plate Number: 4c
Western Environmental Testing Laboratory  
Analytical Report  

Black Eagle Consulting, Inc.  
1345 Capital Blvd, Suite A  
Reno, NV 89502  
Attn: Ron Weber  

Phone: 359-6600  Fax: 359-7766  

EPA Lab ID: NV004  
Received: 06/17/04  
Lab Sample ID: 406-120-1/3  
Reported: 06/25/04  

Black Eagle Consulting, Inc.  
1345 Capital Blvd, Suite A  
Reno, NV 89502  
Attn:  

Phone: 359-6600  Fax: 359-7766  

Project Name/Number: Bella Vista Ranch / 199-08-1  
Sample ID: See Below  
Date/Time Collected: See Below  
Sampled By: Client  

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<tr>
<th>Parameter</th>
<th>Method</th>
<th>Results</th>
<th>Units</th>
<th>Analyzed</th>
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<td>TP 17 A+B 0-1.3 6/15/04 @ 0400</td>
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<td>300.0</td>
<td>310</td>
<td>mg/kg</td>
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<td></td>
<td>pH</td>
<td>9045B</td>
<td>8.44</td>
<td>SU</td>
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<td>Resistivity</td>
<td>2510B</td>
<td>530</td>
<td>Ω.cm</td>
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<td></td>
<td>Sulfate</td>
<td>300.0</td>
<td>76</td>
<td>mg/kg</td>
</tr>
<tr>
<td></td>
<td>Boron</td>
<td>200.7</td>
<td>92</td>
<td>mg/kg</td>
</tr>
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<td>TP 14 B 2-2.7' 6/16/04 @ 0400</td>
<td>Chloride</td>
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<td>540</td>
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<td></td>
<td>Boron</td>
<td>200.7</td>
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<td>mg/kg</td>
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<td>TP 9 B 1.2-2.2 6/16/04 @ 0400</td>
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<td>pH</td>
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<td></td>
<td>Resistivity</td>
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<td></td>
<td>Sulfate</td>
<td>300.0</td>
<td>200</td>
<td>mg/kg</td>
</tr>
<tr>
<td></td>
<td>Boron</td>
<td>200.7</td>
<td>94</td>
<td>mg/kg</td>
</tr>
</tbody>
</table>

Comments: The pH and Resistivity analyses were performed on a paste extract.

Plate 5a
Project No.: 0199-08-1

Andy Smith, Lab Manager
Western Environmental Testing Laboratory
Analytical Report

Black Eagle Consulting, Inc.
1345 Capital Blvd, Suite A
Reno, NV 89502.
Attn: Ron Weber

Phone: 359-6600   Fax: 359-7766

EPA Lab ID: NV004
Received: 06/17/04
Lab Sample ID: 406-120-4/5
Reported: 06/25/04

Project Name/Number: Bella Vista Ranch / 199-08-1
Sample ID: See Below
Date/Time Collected: See Below
Sampled By: Client

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<th>Method</th>
<th>Results</th>
<th>Units</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
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<td>Chloride</td>
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<td>mg/kg</td>
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<tr>
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<td>9.04</td>
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<td>06/21/04</td>
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<tr>
<td>Resistivity</td>
<td>25106</td>
<td>1400</td>
<td>Ω.cm</td>
<td>06/21/04</td>
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<tr>
<td>Sulfate</td>
<td>300.0</td>
<td>25</td>
<td>mg/kg</td>
<td>06/24/04</td>
</tr>
<tr>
<td>Boron</td>
<td>200.7</td>
<td>25</td>
<td>mg/kg</td>
<td>06/22/04</td>
</tr>
</tbody>
</table>

| Chloride  | 300.0  | 900     | mg/kg | 06/25/04   |
| pH        | 9.02   | 9.04    | SU    | 06/21/04   |
| Resistivity | 25106 | 160     | Ω.cm  | 06/21/04   |
| Sulfate   | 300.0  | 490     | mg/kg | 06/24/04   |
| Boron     | 200.7  | 140     | mg/kg | 06/22/04   |

Comments: The pH and Resistivity analyses were performed on a paste extract.

Plate 5b
Project No.: 0199-08-1

Andy Smith, Lab Manager
Western Environmental Testing Laboratory
Analytical Report

Black Eagle Consulting, Inc.
1345 Capital Blvd, Suite A
Reno, NV 89502
Attn: Ron Weber

EPA Lab ID: NV004
Received: 06/17/04
Lab Sample ID: 406-121-1/5
Reported: 07/01/04

Phone: 359-6600 Fax: 359-7766

Project Name/Number: Bella Vista Ranch / 0199-08-1
Sample ID: See Below
Date/Time Collected: See Below
Sampled By: Client

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<th>Results</th>
<th>Units</th>
<th>Analyzed</th>
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<tr>
<td>B-2 6.9'</td>
<td>Boron</td>
<td>200.7</td>
<td>30 ppm</td>
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</tr>
<tr>
<td>TP-2 2.7'</td>
<td>Boron</td>
<td>200.7</td>
<td>5.3 ppm</td>
<td>06/23/04</td>
</tr>
<tr>
<td>TP-16 4.0'</td>
<td>Boron</td>
<td>200.7</td>
<td>81 ppm</td>
<td>06/30/04</td>
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<tr>
<td>TP-19 4.0'</td>
<td>Boron</td>
<td>200.7</td>
<td>32 ppm</td>
<td>06/23/04</td>
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<td>TP-20 6.2'</td>
<td>Boron</td>
<td>201.1</td>
<td>11 ppm</td>
<td>06/23/04</td>
</tr>
</tbody>
</table>

Plate 5c
Project No.: 0199-08-1

Andy Smith, Lab Manager
Liquefaction Potential versus Depth, Boring B-02 and B-03

**Centex Homes**

**Bella Vista Ranch**

Reno, Nevada

**Plate 6**
APPENDIX A

Liquefaction Analyses
# RECOMMENDATIONS FOR LIQUEFACTION

This version (030905) conforms more closely with MathCAD sheet (version jwp0309).

**Location:** Meadow

**Boring ID:** B-03

**Borahole Diameter:** 10" (254 mm)

**Corrected Hammer Efficiency as % of Theoretical Energy (Ea):**

| Depth to Water Table | Soil Unit Weight Above WT (pcf) | Unit WT Above WT | A | C | Averages
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
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<td>720</td>
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<td>2</td>
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<td>12</td>
<td>0.1</td>
<td>3720</td>
<td>3720</td>
<td>120</td>
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</tbody>
</table>

**Note:** *N/A* indicates sample is outside of range of liquefiable soil types.
**NCRR CURVE FOR LIQUEFACTION GRAPHICS FOR BORINGS BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS**

Only cells with blue background and blue text should be modified

---

### Summary of Results

<table>
<thead>
<tr>
<th>Boring ID</th>
<th>Top Depth ft</th>
<th>Elevation</th>
<th>NCR NP CS corresponding to CSR value</th>
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</thead>
<tbody>
<tr>
<td>B-03</td>
<td>4.6</td>
<td>4436.4</td>
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<td>7.1</td>
<td>4433.9</td>
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<td>B-03</td>
<td>52.1</td>
<td>4383.9</td>
<td>25.797</td>
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This analysis assumes there are no significant adjustments to CSR for plasticity or gravel content. These adjustments should modify the CSR value of the data, not the CSR for the clear sand, no fines, no gravel curve. Because magnitude factors are made to adjust the N160 values, curve is made for M=7.5

### Curves

**CRR vs N curve (from Raush Formula) for interpolation**

**Resulting curve:**

---

<table>
<thead>
<tr>
<th>Boring ID</th>
<th>Top Depth ft</th>
<th>Soil Total Unit Weight (pcf)</th>
<th>Stress Reduction in Rd</th>
<th>CSR at Mid Depth of Sample psf</th>
<th>Stress Reduction in Rd</th>
<th>CSR at Mid Depth of Sample psf</th>
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</thead>
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<tr>
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<td>4.6</td>
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<th>Surf Elev ft</th>
<th>Boring ID: B-03</th>
<th>Soil Unit Weight Above Groundwater (pcf): 120</th>
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</table>

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**Revision Services**

Developed by:  
Calculated by:  
Checked by:
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<tr>
<th>Borehole ID</th>
<th>Top Depth Description</th>
<th>Soil Unit Weight Above WT (pcf)</th>
<th>New Weight (pcf)</th>
<th>Plasticity</th>
<th>Gravel</th>
<th>Elimination Code</th>
<th>SA</th>
<th>SS</th>
<th>SM</th>
<th>SC</th>
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</table>

**Copying Data:**

- **SA:** Clean sand (or blank)
- **SS:** Sand with 6-15% silt
- **SM:** Sand with >15% silt
- **SC:** Sand with >15% clay

**Corrected Hammer Efficiency:**

This means that actual hammer energy for safety hammer is 90% of 25% = 55% if hammer calibration value is available, it will be used in same manner.

**Sampling Method:**

- 1 1-1/2" ID sampler (space for liners, liners not used)
- 1 1-3/8" ID sampler (with liners or no liner space)

**Energy Ratio:**

- Car = correction relative to 60% theoretical hammer energy
- Cb = Borehole Diameter
- Cb = 1.3

**Rod Length:** Assume rod is probably at least 5 feet longer than the hole is deep

**Check:**

- All SPT locations are driven 1.5 feet

**Revision:**

- Revised: 11/16/2003
- Developed by: JWR
- Calculated by: PPT
<table>
<thead>
<tr>
<th>Zon Number</th>
<th>Depth (ft)</th>
<th>N100</th>
<th>Factor</th>
<th>Factor</th>
<th>RDR</th>
<th>QDR</th>
<th>RDR</th>
<th>Factor</th>
<th>Factor</th>
<th>Value</th>
<th>Value</th>
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<td>0.02</td>
<td>0.08</td>
<td>2.26</td>
<td>1.18</td>
</tr>
</tbody>
</table>

Values are calculated using the formula:

\[ \text{Value} = \text{Factor} \times \text{RDR} \]

Where:
- **RDR** is the Reduction Factor
- **QDR** is the Qualification Factor

**N100** is calculated as:

\[ \text{N100} = \frac{\text{RDR} \times \text{QDR}}{100} \]

**Factor** is determined by the depth and site conditions.
# NCRR Curve for Liquefaction Graphics for Borings Based Upon 1996 and 1998 NCEER Workshop Recommendations

Only cells with blue background and blue text should be modified.

<table>
<thead>
<tr>
<th>Boring ID</th>
<th>Top Depth ft</th>
<th>Soil Total Unit Wt (pcf)</th>
<th>( \sigma_{vc} ) at Mid-Depth of Sample psf</th>
<th>( \sigma_{vu} ) at Mid-Depth of Sample psf</th>
<th>Stress Reduction Rd</th>
<th>CSR with depth for M=7.25 and clean sand</th>
<th>( \text{N}_{cr} ) corresponding to CSR</th>
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<tbody>
<tr>
<td>B-02</td>
<td>0.4</td>
<td>120</td>
<td>828</td>
<td>828</td>
<td>0.58</td>
<td>0.225</td>
<td>20.740</td>
</tr>
<tr>
<td>B-02</td>
<td>0.4</td>
<td>120</td>
<td>828</td>
<td>828</td>
<td>0.58</td>
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<tr>
<td>B-02</td>
<td>0.4</td>
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<td>0.58</td>
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<td>20.740</td>
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<td>828</td>
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<tr>
<td>B-02</td>
<td>0.4</td>
<td>120</td>
<td>828</td>
<td>828</td>
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<tr>
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<td>0.4</td>
<td>120</td>
<td>828</td>
<td>828</td>
<td>0.58</td>
<td>0.225</td>
<td>20.740</td>
</tr>
</tbody>
</table>

This analysis assumes there are no significant adjustments to CSR for plasticity or gravel content. These adjustments should modify the CSR value of the data, not the CSR for the clean sand, no fines, no gravel curve. Because magnitude factors are made to adjust the N160 values, curve is made for M=7.5. CRR vs N curve (from Raush Formula) for interpolation Resulting curve:
<table>
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<tr>
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<th>(CRR)_{N160}</th>
<th>(N160)_{N160}</th>
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<tr>
<td>2.243</td>
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**Ncrr vs Depth**

Graph showing the relationship between Ncrr and depth.
LEVEL-GROUND LIQUEFACTION ANALYSIS USING STANDARD PENETRATION TESTING (SPT) AND BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Location: Bella Vista Ranch Boring B-02
Analyzed Zone: 15-17.5 feet depth

This version of the liquefaction analysis procedure supports the spreadsheet analysis of multiple points

References


4. Ishihara, Personal communication.


Unit Conversions

\[ \text{psf} := \frac{160}{\text{ft}^2} \quad \text{pcf} := \frac{160}{\text{ft}^3} \quad \text{kPa} := 1000\text{Pa} \]

Input Data

Sample Top Depth:
Depth to Mid-Sample (typically 0.5’ waste barrel +1’ sampler length/2 = 1’):
Soil Total Unit Weight above Water Table:
Soil Total Unit Weight below Water Table:
SPT N-Value at Sample Depth:
Soil Sample Plasticity Index (PI):
Percentage of Fines or Fines Content [%]:
Percentage of Gravel or Gravel Content [%]:
Thickness of Potentially Liquefiable Zone:

Checked By:

\[ d := 15\text{ft} \]
\[ l := 1.0\text{ft} \]
\[ \gamma_{\text{above}} := 110\text{pcf} \]
\[ \gamma := 120\text{pcf} \]
\[ N_m := 10 \]
\[ \text{PI} := 0 \]
\[ \text{FC} := 20 \]
\[ \text{GC} := 6 \]
\[ \tau_{\text{w}} := 2.5\text{ft} \]
Depth to Ground Water during Exploration:
during Liquefaction Event:
Borehole Diameter:
Length of Drill Rod above the Ground Surface to Hammer:
Sampler Type (Standard = 1, Sampler without Liners = 2):
Hammer Type (Cathead = 1, Auto Hammer [Uncorrected = 2, Corrected = 3]):
Corrected Hammer Efficiency (Must enter 3 for Hammer Type above)% not decimal: ER = 68
this is relative to theoretical 100%.
Horizontal Peak Ground Acceleration (PGA) [%g]:
Moment Magnitude of Earthquake:
Calculations, Section 1: Vertical Soil Stresses
Calculate Depth at Midpoint of Sample:
\[ z \approx d + 1 \]
Calculate Soil Vertical Total Stress at Midpoint of Sample:
\[ \sigma_v := \gamma_{above} d_{gw} + \gamma (z - d_{gw}) \]
Calculate Soil Effective Unit Weight at Sample Depth (Since sample is below the ground water surface):
\[ \gamma_{eff} := \gamma - 62.4 \text{pcf} \]
Calculate Effective Stress at Midpoint of Sample for SPT Correction:
\[ \sigma_{veff} := \sigma_v - [62.4 \text{pcf} \cdot (z - d_{gw})] \]
Calculate Soil Vertical Total Stress at Midpoint of Sample for EQ event:
\[ \sigma_{vatEQ} := \gamma_{above} d_{gw} + \gamma (z - d_{gw}) \]
Calculate Effective Stress at Midpoint of Sample for EQ event:
\[ \sigma_{veffatEQ} := \sigma_{vatEQ} - [62.4 \text{pcf} \cdot (z - d_{gw})] \]
Calculations, Section 2: SPT N-Value Correction
Calculate Overburden Pressure Correction Factor:
As noted by Reference 6, the Overburden correction is to have N values representative of the equivalent penetration resistance at a hypothetical overburden stress of 100 kpa, 1 ton/ft², or roughly 1 atmosphere. The use of "atmospheres" is merely a convenience for conversion between unit systems, and is not related to local atmospheric pressure. \[ P_a = 100 \text{kPa} \]
\[ P_a = 2.089 \times 10^3 \text{ psf} \]
\[ C_n = 1.276 \]
Determine Hammer Energy Correction Factor:
\[ C_e := \begin{cases} 1.0 & \text{if } (\text{Hammer} = 1) \\ 1.3 & \text{if } (\text{Hammer} = 2) \\ \frac{\text{ER}}{60} & \text{if } (\text{Hammer} = 3) \\ 0 & \text{otherwise} \end{cases} \]

If \( C_e = 0 \), then input error.

Determine Borehole Diameter Correction Factor:

\[ C_b := \begin{cases} 1.00 & \text{if } (65\text{mm} < d_b < 115\text{mm}) \\ 1.05 & \text{if } (150\text{mm} < d_b < 154\text{mm}) \\ 1.15 & \text{if } (200\text{mm} < d_b < 204\text{mm}) \\ 0 & \text{otherwise} \end{cases} \]

If \( C_b = 0 \), then input error.

Calculate Drill Rod Length:

\[ l_r := d + l_{\text{rgs}} \]

\[ l_r = 20 \text{ ft} \quad l_r = 6.096 \text{ m} \]

Determine Rod Length Correction Factor:

\[ C_r := \begin{cases} 0.75 & \text{if } (l_r < 3\text{m}) \\ 0.80 & \text{if } (3\text{m} \leq l_r < 4\text{m}) \\ 0.85 & \text{if } (4\text{m} \leq l_r < 6\text{m}) \\ 0.95 & \text{if } (6\text{m} \leq l_r < 10\text{m}) \\ 1.00 & \text{if } (10\text{m} \leq l_r < 30\text{m}) \\ 0 & \text{otherwise} \end{cases} \]

If \( C_r = 0 \), then input error.

Determine Sampler Correction Factor (with or without liners):

\[ C_s := \begin{cases} 1.0 & \text{if } (\text{Sampler} = 1) \\ 1.2 & \text{if } (\text{Sampler} = 2) \\ 0 & \text{otherwise} \end{cases} \]

If \( C_s = 0 \), then input error.

Calculate Corrected SPT (\( N_{160} \)) Value:

\[ N_{160} := (N_m \cdot C_n \cdot C_e \cdot C_b \cdot C_r \cdot C_s) \]

\[ N_{160} = 14.4 \]

Calculations, Section 3: \((N_{160})_{\text{equivalent}}\) Equivalent Clean Sand Correction

Calculate Clean Sand Correction Coefficients:

\[ \alpha := \begin{cases} 0 & \text{if } (\text{FC} \leq 5) \\ \exp{[1.76 - \frac{190}{\text{FC}^2}]} & \text{if } (5 < \text{FC} < 35) \\ 5.0 & \text{if } (\text{FC} \geq 35) \\ 0 & \text{otherwise} \end{cases} \]

If \( \alpha = 0 \), then input error.


\[ \beta = \begin{cases} 
1.0 & \text{if } (FC \leq 5) \\
0.99 + \left( \frac{FC^{1.5}}{1000} \right) & \text{if } (5 < FC < 35) \\
1.2 & \text{if } (FC \geq 35) \\
0 & \text{otherwise}
\end{cases} \]

If \( \beta = 0 \), then input error.

Calculate Corrected \( (N_{1})_{60} \) Equivalent Clean Sand Value:

\[ N_{160cs} = \alpha + \beta \cdot (N_{160}) \]

Calculations, Section 4: Cyclic Stress Ratio and Cyclic Resistance Ratio (CSR) Checked By:

Calculate Cyclic Resistance Ratio (CRR) for Moment Magnitude \( M_w = 7.5 \) Earthquake (This is the boomerang curve on the SPT ver CSR (plot - function of clean sand resistance only):

\[ \text{CRR}_{7.5} := \begin{cases} 
\frac{1}{34 - N_{160cs}} + \frac{N_{160cs}}{135} + \frac{50}{(10 \cdot N_{160cs} + 45)^2} - \frac{1}{200} & \text{if } N_{160cs} < 34 \\
\text{otherwise}
\end{cases} \]

CRR\(_{7.5} = 0.205 \)

Calculate Stress Reduction Coefficient to Account for Flexibility in Soil Profile:

\[ r_d := \begin{cases} 
(1.0m - 0.00765 \cdot z) & \text{if } (z \leq 9.15m) \\
(1.174m - 0.0267 \cdot z) & \text{if } (9.15m < z \leq 23m) \\
0 & \text{otherwise}
\end{cases} \]

\[ r_d = 3.158 \text{ ft} \]

If \( r_d = 0 \), then input error.

Redefine Stress Reduction Coefficient for Calculations:

\[ r_d := \frac{r_d}{m} \]

Calculate Cyclic Stress Ratio (CSR) using water level and effective stress during the earthquake, not exploration levels:

\[ \text{CSR} := 0.65 \cdot \left( \frac{a_{\max}}{g} \right) \cdot \left( \frac{\sigma_{\text{satEQ}}}{\sigma_{\text{effEQ}}} \right) r_d \]

CSR = 0.38

Calculations, Section 5: CSR Scaling Factors

Note: Cyclic stress ratio (CSR) is divided by the magnitude scaling factor, gravel content, and plasticity factor to compare to the cyclic resistance ratio curve. All the modifications are put on the CSR side of the equation, because (a) the 1998 NCEER method does not specify whether to apply scaling factors to CSR (division) or Cyclic Resistance Ratio (multiplication), and (b) graphically, we can compare a wide variety of data with and without modifications to a single CRR curve and put all modifications in CSR.

Calculate Magnitude Scaling Factor (MSF) to Scale CSR Data:

\[ \text{MSF} := \frac{10^{2.24}}{M_w^{2.56}} \]

MSF = 1

Reproduce Figure 8-7: Reference 2 (Effect of Gravel Content on Liquefaction Resistance of Gravelly Soils):

Data for Gravel Content: Data for Plasticity Modification
Note - gravel scaling factor is to account for unrepresentatively high blows for gravel layers - should decrease overall factor of safety.

**Calculate Gravel Content Scaling Factor (GCSF):**
\[
GCSF := \text{interp}(GC_g, K_{\text{gravel}}, GC)
\]

**Calculate Plasticity Index Scaling Factor (PISF):**
\[
PISF := \text{interp}(PI_g, SR_g, PI)
\]

**Reproduce Chart for Modification of Cyclic Strength Allowing for Effects of Plasticity** (From Ishihara):

**Calculations, Section 6: Factor of Safety (FS) Against Liquefaction**

**Calculate Modified and Scaled CSR:**

\[H_{\text{bec}} \text{mainvot\projects\0199\08-1\calca\NCEER Liquefaction Bg B-02 15 ft layer with su0311.mcd}\]
Calculate Factor of Safety Against Liquefaction:

\[
FS := \left( \frac{CRR \cdot 7.5}{\text{PISF}} \right) \cdot \left( \frac{\text{MSF}}{\text{GCSF}} \right) \cdot \frac{\text{CSR}}{\text{mod}}
\]

Determine Liquefaction Hazard based upon Calculated Factor of Safety:

\[
\text{Hazard} = \begin{cases} 
0 & \text{if } (FS \geq 1.1) \\
1 & \text{if } (1.0 < FS < 1.1) \\
2 & \text{otherwise}
\end{cases}
\]

Hazards Levels:

- Hazard = 0: Negligible
- Hazard = 1: Possible
- Hazard = 2: Likely

Calculations, Section 7: Potential Settlement due to Liquefaction

Data to Reproduce Figure 5 from Reference 5:

\[
k_1 := 0..5 \quad k_2 := 0..10 \quad k_3 := 0..13 \quad k_4 := 0..15
\]
Figure 5 Plot From Reference 5:
Determine the percentage of volumetric strain (in decimal form) using the CSR/N₁(60) point shown in the plot above:

\[ \varepsilon = 0.02 \]

Calculate Estimated Settlement as a Result of Liquefaction:

\[ S = 0.6 \text{ in} \]
Please use with caution - based on limited case studies of large-strain liquefaction failures, may not be appropriate at all for small-strain liquefaction failures.

Reproduce Chart for Residual Undrained Shear Strength from Reference 6

\[
\begin{array}{ccc}
N_{su} = \begin{pmatrix}
0 \\
6 \\
10 \\
13 \\
20
\end{pmatrix} & S_{su} = \begin{pmatrix}
0 \\
100 \\
270 \\
1040
\end{pmatrix} & \begin{pmatrix}
0 \\
6 \\
10 \\
16
\end{pmatrix} & S_{su} = \begin{pmatrix}
0 \\
320 \\
450 \\
720 \\
1100
\end{pmatrix}
\end{array}
\]

Note: Chart is extrapolated above \( N = 15 \) and below \( N = 3 \)

Calculate Upper and Lower Bound Undrained Strength from Seed and Harder:

\[
\begin{align*}
S_{ul} &= \begin{cases} 
\text{round}(\text{interp}(N_{su}, S_{su}, N_{160cs}) - 1) & \text{if } N_{160cs} \leq 20 \\
0 & \text{otherwise}
\end{cases} \\
S_{uu} &= \begin{cases} 
\text{round}(\text{interp}(N_{su}, S_{su}, N_{160cs}) - 1) & \text{if } N_{160cs} \leq 20 \\
0 & \text{otherwise}
\end{cases}
\end{align*}
\]

As noted by Reference 6, "It is recommended that the lower bound, or near-lower-bound relationship between \( N_{160cs} \) and [residual undrained shear strength] be used... at this time, owing to scatter and uncertainty, and the limited number of case studies back-analyzed to date."

Calculations, Section 9: Residual Undrained Shear Strength from Reference 7

\[
S_{yield} = \begin{cases} 
\sigma_{veff} \left(0.205 + 0.0075 \cdot N_{160}\right) & \text{if } N_{160} \leq 12 \\
0 & \text{otherwise}
\end{cases}
\]

This value is primarily relevant for "static" rather than seismic liquefaction

\[
S_{triggered} = \begin{cases} 
\sigma_{veff} \left(0.03 + 0.0075 \cdot N_{160}\right) & \text{if } N_{160} \leq 12 \\
0 & \text{otherwise}
\end{cases}
\]

Calculations, Section 10: Summary of Results

Layer Depth, \( d \):

- Blowcounts:
  - Liquefied? Hazard Levels: Negligible = 0 Marginal = 1 Liquefies = 2
  - Settlement Strain
  - Undrained Strength: Seed and Harder
  - Yield undrained strength for static failures (Olsen and Stark 2003)
  - Liquefied residual strength (Olsen and Stark 2003)

These values will be zero if \( N_{160} \) is outside of the correlated range

\[
\begin{align*}
N_m &= 10 & N_{160} &= 14.42 & N_{160cs} &= 19.2 \\
FS &= 0.525 & \text{Hazard} &= 2 \\
e &= 0.02 & \text{Manually picked} \\
S_{ul} &= 950 \\
S_{triggered} &= 0 \text{ psf} \\
S_{triggered} &= 0 \text{ psf}
\end{align*}
\]
LEVEL-GROUND LIQUEFACTION ANALYSIS USING STANDARD PENETRATION TESTING (SPT) AND BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Location: Bella Vista Ranch Boring B-03
AnaLyzed Zone: 25-27.5 feet depth

This version of the liquefaction analysis procedure supports the spreadsheet analysis of multiple points.

References


4. Ishihara, Personal communication


Unit Conversions

\[ \text{psf} = \frac{\text{lbf}}{\text{ft}^2} \quad \text{pcf} = \frac{\text{lb}}{\text{ft}^3} \quad \text{kPa} = 1000 \text{Pa} \]

Input Data

Sample Top Depth:

Depth to Mid-Sample (typically 0.5' waste barrel +1' sampler length/2 = 1'):

Soil Total Unit Weight above Water Table:

Soil Total Unit Weight below Water Table:

SPT N-Value at Sample Depth:

Soil Sample Plasticity Index (PI):

Percentage of Fines or Fines Content [%]:

Percentage of Gravel or Gravel Content [%]:

Thickness of Potentially Liquefiable Zone:

Checked By:

d := 25ft

\[ \gamma_{\text{above}} := 110 \text{pcf} \]

\[ \gamma := 120 \text{pcf} \]

\[ N_m := 18 \]

\[ \text{PI} := 5 \]

\[ \text{FC} := 22 \]

\[ \text{GC} := 0 \]

\[ L := 2.5ft \]
Depth to Ground Water during Exploration:  
during Liquefaction Event:  
Borehole Diameter:  
Length of Drill Rod above the Ground Surface to Hammer:  
Sampler Type (Standard = 1, Sampler without Liners = 2):  
Hammer Type (Cathead = 1, Auto Hammer [Uncorrected = 2, Corrected = 3]):  
Corrected Hammer Efficiency (Must enter 3 for Hammer Type above) (% not decimal):  
Horizontal Peak Ground Acceleration (PGA) [%g]:  
Moment Magnitude of Earthquake:  

Calculations, Section 1: Vertical Soil Stresses  
Calculate Depth at Midpoint of Sample:  
\[ z = \frac{d}{2} \]  
Calculate Soil Vertical Total Stress at Midpoint of Sample:  
\[ \sigma_v = \gamma_{above}d_{gw} + \gamma(z - d_{gw}) \]  
\[ \sigma_v = 3074 \text{ psf} \]  
Calculate Soil Effective Unit Weight at Sample Depth (Since sample is below the ground water surface):  
\[ \gamma_{eff} = \gamma - 62.4 \text{pcf} \]  
Calculate Effective Stress at Midpoint of Sample for SPT Correction:  
\[ \sigma_{veff} = \sigma_v + \left[ 62.4 \text{pcf} \cdot (z - d_{gw}) \right] \]  
\[ \sigma_{veff} = 1.739 \times 10^3 \text{ psf} \]  
Calculate Soil Vertical Total Stress at Midpoint of Sample for EQ event:  
\[ \sigma_{vatEQ} = \gamma_{above}d_{gw} + \gamma(z - d_{gw}) \]  
Calculate Effective Stress at Midpoint of Sample for EQ event:  
\[ \sigma_{veffatEQ} = \sigma_{vatEQ} + \left[ 62.4 \text{pcf} \cdot (z - d_{gw}) \right] \]  
\[ \sigma_{veffatEQ} = 1.707 \times 10^3 \text{ psf} \]  

Calculations, Section 2: SPT N-Value Correction  
Calculate Overburden Pressure Correction Factor:  
As noted by Reference 6, the Overburden correction is to have N values representative of the equivalent penetration resistance at a hypothetical overburden stress of 100 kpa, 1 ton/ft^2, or roughly 1 atmosphere. The use of "atmospheres" is merely a convenience for conversion between unit systems, and is not related to local atmospheric pressure.  
\[ P_a := 100 \text{kpa} \]  
\[ P_a = 2.089 \times 10^3 \text{ psf} \]  
\[ C_n = 1.096 \]  
Determine Hammer Energy Correction Factor:  
\[ C_h := \left( \frac{P_a}{\sigma_{veff}} \right)^{0.5} \text{ if } \left( \frac{P_a}{\sigma_{veff}} \right)^{0.5} \leq 1.7 \]  
\[ 1.7 \text{ otherwise} \]
Determine Bit and Diameter Correction Factor:

\[ C_b = \begin{cases} 
1.00 & \text{if } (65\text{mm} < d_b < 91.5\text{mm}) \\
1.05 & \text{if } (91.5\text{mm} < d_b < 154\text{mm}) \\
1.15 & \text{if } (200\text{mm} < d_b < 204\text{mm}) \\
1.20 & \text{if } \text{otherwise} 
\end{cases} \]

If \( C_b = 0 \), then input error.

Calculate Drill Rod Length:

\[ L_r = d + \frac{r}{2} \]

Determine Rod Length Correction Factor:

\[ C_r = \begin{cases} 
0.75 & \text{if } (L_r < 3m) \\
0.80 & \text{if } (3m \leq L_r < 6m) \\
0.85 & \text{if } (6m \leq L_r < 10m) \\
0.90 & \text{if } (10m \leq L_r < 30m) \\
1.00 & \text{if } \text{otherwise} 
\end{cases} \]

If \( C_r = 0 \), then input error.

Determine Sampler Correction Factor (with or without liners):

\[ C_s = \begin{cases} 
1.0 & \text{if } (\text{Sampler} = 1) \\
1.2 & \text{if } (\text{Sampler} = 2) \\
0 & \text{otherwise} 
\end{cases} \]

If \( C_s = 0 \), then input error.

Calculate Corrected SPT \( N_{160} \) Value:

\[ N_{160} = N_p C_n C_e C_b C_r C_s \]

\( N_{160}^{eq} = 22.3 \)

Checked By:

\( \alpha = 3.925 \)

if \( \alpha = 0 \), then input error.
Calculate Corrected $N_{160c}$ Equivalent Clean Sand Value:

$$N_{160c} = c + \beta(N_{160})$$

Calculations, Section 4: Cyclic Stress Ratio and Cyclic Resistance Ratio (CSR) Checked By:

Calculate Cyclic Resistance Ratio (CRR) for Moment Magnitude $M_w = 7.5$ Earthquake (This is the boomerang curve on the SPT ver CSR plot - function of clean sand resistance only):

$$CRR_{7.5} = \left\{ \begin{array}{ll}
\frac{1}{34 - N_{160c}} + \frac{N_{160c} \cdot 50}{133 \cdot 100} & \text{if } N_{160c} < 34 \\
0 & \text{otherwise}
\end{array} \right.$$ 

$$CRR_{7.5} = 0.381$$

Calculate Stress Reduction Coefficient to Account for Flexibility in Soil Profile:

$$r_d = \left\{ \begin{array}{ll}
(1.0m - 0.0.0765z) & \text{if } (z \leq 9.15m) \\
(1.174m - 0.0257z) & \text{if } (9.15m < z \leq 23m) \\
0 & \text{otherwise}
\end{array} \right.$$ 

$$r_d = 0.939m$$

Redefine Stress Reduction Coefficient for Calculations:

$$r_d = \frac{r_d}{m}$$

Calculate Cyclic Stress Ratio (CSR) using water level and effective stress during the earthquake, not exploration curve:

$$CSR = 0.65 \left( \frac{\sigma_{vert eff}}{\sigma_{vert eff \text{EQ}}} \right) r_d$$

$$CSR = 0.423$$

Calculations, Section 5: CSR Scaling Factors

The Cyclic Stress Ratio (CSR) is divided by the magnitude scaling factor, gravel content, and plasticity factor to compare to the cyclic resistance ratio curve. All the modifications are put on the CSR side of the equation, because (a) the 1998 NCEER method does not specify whether to apply scaling factors to CSR (division) or Cyclic Resistance Ratio (multiplication), and (b) graphically, we can compare a wide variety of data with and without modifications to a single CRR curve and put all modifications in CSR.

Calculate Magnitude Scaling Factor (MSF) to Scale CSR Data:

$$MSF = 10^{\frac{M_w - 2.56}{2.24}}$$

$$MSF = 1$$

Reproduce Figure 8-7, Reference 2 (Effect of Gravel Content on Liquefaction Resistance of Gravelly Soils):

Data for Gravel Content: 

Data for Plasticity Modification:

$$C_p = 0.67$$

If $C_p < 0.67$, then input error.
Calculate Gravel Content Scaling Factor (GCSF):

\[
GCSF = \text{interp}(GC_g, K_{\text{gravel}}, GC)
\]

GCSF = 1

Reproduce Chart for Modification of Cyclic Strength Allowing for Effects of Plasticity (From Ishihara):

Calculate Plasticity Index Scaling Factor (PISF):

\[
PISF = \text{interp}(PI_g, SR_g, PI)
\]

PISF = 1

Calculations, Section 6: Factor of Safety (FS) Against Liquefaction

\[
\text{Factor of Safety (FS)} = \frac{\text{shear strength}}{\text{shear stress}}
\]

Checked By:
Calculate Factor of Safety Against Liquefaction:

$$FS := \left( \frac{CSR \cdot GCSF}{CSR \cdot GCSF} \right) \cdot \frac{MSF}{PISF}$$

Determine Liquefaction Hazard based upon Calculated Factor of Safety:

$$\text{Hazard} := \begin{cases} 0 & \text{if } (FS \geq 1.1) \\ 1 & \text{if } (1.0 < FS < 1.1) \\ 2 & \text{otherwise} \end{cases}$$

Hazard Levels

- Hazard = 0, Negligible = 0
- Hazard = 1, Possible = 1
- Hazard = 2, Likely = 2

Calculations, Section 7: Potential Settlement due to Liquefaction

Data to Reproduce Figure 5 from Reference 5:

- $$k_1 := 0.5$$
- $$k_2 := 0.10$$
- $$k_3 := 0.13$$
- $$k_4 := 0.15$$

$$N_{10} := \begin{cases} 0 & \text{if } (FS \geq 1.1) \\ 1 & \text{if } (1.0 < FS < 1.1) \\ 2 & \text{otherwise} \end{cases}$$

Checked By:
Figure 5 Plot From Reference 5:
Determine the percentage of volumetric strain [in decimal form] using the CSR/N1(60) point shown in the plot above:

\[ \varepsilon_{\text{v}} = 0.0145 \]

Calculate Estimated Settlement as a Result of Liquefaction:

\[ S = \varepsilon \cdot T \]

\[ S = 0.4 \text{ in} \]
Please use with caution based on limited case studies of large-strain liquefaction failures; may not be appropriate at all for small-strain liquefaction failures.

Reproduce Chart for Residual Undrained Shear Strength from Reference 9

Note: Chart is extrapolated above \( N = 15 \) and below \( N = 3 \)

Calculations, Section 9: Residual Undrained Shear Strength from Reference 7

\[
S_u = \begin{cases} 
\text{round}(\text{interp}(N_{su}, S_{sul}, N_{160cs}), -1) & \text{if } N_{160cs} \leq 20 \\
0 & \text{otherwise}
\end{cases}
\]

\[
S_u = \begin{cases} 
\text{round}(\text{interp}(N_{su}, S_{sul}, N_{160cs}), -1) & \text{if } N_{160cs} \leq 20 \\
0 & \text{otherwise}
\end{cases}
\]

As noted by Reference 6, "it is recommended that the lower bound, or near-lower-bound relationship between \( N_{160cs} \) and [residual undrained shear strength] be used...at this time, owing to scatter and uncertainty, and the limited number of case studies back-analyzed to date."

Calculations, Section 10: Summary of Results

Layer Depth, \( d \):

- Blowcounts:
- Liquefied? Hazard Levels: Negligible = 0 Marginal = 1 Liquefies = 2
- Settlement Strain:
- Undrained Strength: Seed and Harder
- Yield undrained strength for static failures (Olsen and Stark 2003)
- Liquefied residual strength (Olsen and Stark 2003)
- These values will be zero if \( N_{160} \) is outside of the correlated range.
Appendix G
First Amended Public Facility Site Agreement
FIRST AMENDED AND RESTATED PUBLIC FACILITY SITE AGREEMENT

BETWEEN

CITY OF RENO,
A municipal corporation

AND

CORONA CYAN LLC,
A Delaware Limited Liability Corporation
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FIRST AMENDED AND RESTATED
PUBLIC FACILITY SITE AGREEMENT

THIS FIRST AMENDED AND RESTATED PUBLIC FACILITY SITE AGREEMENT ("Agreement") is entered into by and between the CITY OF RENO, a municipal corporation ("City"); and CORONA CYAN LLC, a Delaware limited liability company and its successors and assigns ("Developer"). In consideration of the mutual covenants and agreements hereinafter set forth, the parties agree as follows:

1 GENERAL

1.1 On February 14, 2007, the City and Centex Homes, a Nevada general partnership ("Centex"), entered into a Fire Station Development Agreement ("Prior Agreement") which was executed by the City on March 14, 2007. On March 29, 2008, Centex and Developer, executed a General Assignment, Bill of Sale and Assignment and Assumption Agreement (the "General Assignment") whereby Centex granted, sold, assigned, transferred, conveyed and delivered to Developer any and all rights and obligations previously held by Centex in and under the Prior Agreement, all in connection with Developer's acquisition from Centex of the Bella Vista Ranch real estate development project located in Reno, Nevada. Pursuant to the General Assignment, Developer succeeded to the rights and obligations of Centex under the Prior Agreement and is now the "Developer" (as that term is defined in the Prior Agreement).

1.2 Pursuant to Sections 1.2 and 3.4 of the Prior Agreement, Centex voluntarily agreed and offered to dedicate to the City a fire station site and construct a turnkey fire station as indicated in the Prior Agreement. Pursuant to Section 5.3 of the Prior Agreement, if the fire station has not been constructed, Centex may assign its obligation to construct the fire station subject to approval by the City. The City desires to approve an assignment of the Prior Agreement to Developer, as is amended herein.
1.3 The City and Developer desire to amend the Prior Agreement to modify their respective obligations thereunder, and to provide for, among other modifications, the application of the Prior Agreement, as amended, to the 637+/- acres of real property located in the City of Reno and more particularly described in Exhibit "A" attached hereto and incorporated herein by this reference. This Agreement covers the following two (2) planned unit developments (PUD's): 1) City of Reno Case No. LDC05-00127, the planned unit development handbook which was approved by the City in August, 2005 (the "Phase 1 Handbook") as may be amended; and 2) City of Reno Case No. LDC10-00051, the planned unit development handbook (the "Phase 2 Handbook") as may be amended, which is currently being processed by the City. Both projects, for ease of reference are referred to collectively as the PUD's and all terms herein apply to both projects. This Agreement is subject to all other provisions contained in the applicable PUD's.

1.4 Pursuant to the provisions of this Agreement, Developer will transfer to the City by a Grant, Bargain and Sale Deed that certain Public Facility Site defined in Section 2 below, and make certain contributions from the PUD's toward the City's construction of a fire station that will serve the PUD's.

1.5 The Public Facility Site defined in Section 2 below, and all improvements thereon shall not be part of any homeowners' associations, landscape maintenance districts, drainage districts, or any other association or district established as a part of the PUD.

1.6 Upon full execution hereof and payment of the Initial Contribution (as defined below), this Agreement fully amends, restates, and supersedes the Prior Agreement.
2 TRANSFER OF PUBLIC FACILITY SITE TO THE CITY

The Public Facility Site is more particularly described in Exhibit "B" (the "Public Facility Site"). Promptly following full execution of this Agreement, Developer shall execute and cause to be recorded at Developer's sole cost and expense a Grant Bargain and Sale Deed in the form attached hereto as Exhibit "C", and all related transfer documents approved by the City Attorney's Office which will transfer ownership of the Public Facility Site to the City. The Public Facility Site shall be transferred to the City free and clear of all encumbrances and liens except for permitted exceptions agreed to by the City in its reasonable discretion. When ownership of the Public Facility Site is transferred to the City, it shall be in good condition, free of any hazardous waste, weeds and/or debris, and shall include all water rights, if any, owned by the Developer. The Developer shall bring all utilities up to the Public Facility Site prior to transfer of ownership to the Public Facility Site to the City. The Developer shall also execute a Developers Release and Affidavit in the form attached as Exhibit "D". With this transfer, the Developer hereby waives any reversionary rights to the Public Facility Site, including any rights under NRS 268.050. Once the City receives the Initial Contribution (defined below) and the City has received a fully executed Grant Bargain and Sale Deed and related documents that has been recorded by the Developer in the official records of Washoe County, the Developer shall have no further responsibility, liability, or obligation for the Public Facility Site and the City agrees to take ownership and maintain the Public Facility Site in accordance with City codes.

3 CONTRIBUTIONS

3.1 Initial Contribution. Within thirty (30) days of execution of this Agreement, Developer shall pay to the City the sum of One Million and No/100ths Dollars ($1,000,000.00) (the "Initial Contribution"), which funds shall be placed in a restricted City account and shall
only be used by the City toward the construction of a fire station which will serve the PUD’s consistent with the City’s response times utilized to provide fire service. The location of this fire station shall be in the sole discretion of the City but the location shall be adequate to provide fire services to the PUD’s as noted above. The Initial Contribution shall be comprised of the following and shall be paid as follows: (1) Developer shall cause to be transferred to the City all right, title, and interest in and to that certain deposit account with Wells Fargo Bank, which account is identified as account number #1763113667 (the “Account”) which balance shall be no less than Two Hundred Twenty Seven Thousand and No/100ths ($227,000.00). This Account is currently owned by Centex Homes, a Nevada general partnership (Centex). Centex shall be a party and signatory to this Agreement for the sole purpose of transferring ownership of this Account to the City. Once Centex has caused this Account to be transferred to the City, Centex shall have no further obligations under this Agreement. (2) The Developer shall also authorize the transfer and release to the City of all funds the City has collected and currently holds for the issuance of building permits for the PUD’s pursuant to the Prior Agreement (Building Permit Funds). This amount is estimated to be One Hundred Twenty Thousand and No/100ths ($120,000.00). Developer shall pay to the City, via wire transfer, an amount equal to the difference between the Initial Contribution and the actual balances in the Account and Building Permit Funds at the time the Account and Building Permit Funds are transferred from or released by Developer to the City.

If the Initial Contribution is not paid to City within this thirty (30) day period, interest shall accrue at the rate of one (1) percent, compounded monthly, until the Initial Contribution has been paid to the City. In addition to the above, if the Initial Contribution is not paid by the Developer to the City within thirty (30) days, this shall be a material breach of this Agreement.
and Developer shall have the full obligation to construct a turn-key fire station at the Public Facility Site by December 31, 2025 but shall have no further obligations hereunder. The City shall also withhold all building permits if the Initial Contribution is not paid within (30) days.

3.2 Contributions. In addition to the Initial Contribution, Developer shall provide contributions for the construction of the fire station in connection with the development of each of the PUD’s which obtain building permits after the execution of this Agreement. The contribution due (the “Contribution” or “Contributions”) for each Unit under this Section 3.2 shall be as follows: (1) the sum of Three Hundred and No/100ths Dollars ($300.00) for each Residential Unit constituting a single family dwelling; (2) the sum of Two Hundred and No/100ths Dollars ($200.00) for each Residential Unit constituting an individual multi-family dwelling; and (3) thirty five cents ($0.35) per gross building square foot for Non-Residential Units. As used herein, “Residential Unit” means any single family dwelling or individual multi-family dwelling in the Project, and “Non-Residential Unit” means any stand-alone building in the Project located upon property holding a commercial land use designation which is not a “Residential Unit”. (Residential Units and Non-Residential Units may be referred to herein individually as a “Unit” and collectively as “Units”). Units shall not include civic uses, such as parks, schools, recreational amenities (e.g. golf course, fitness center, community center, or homeowner association facilities), open space, wetlands, common area, government-owned facilities, streets, flood control improvements, etc (collectively, the “Civic Uses”). It is noted that certain Units that have already obtained building permits paid at a different rate, which is deemed to be adequate and no further capital contributions shall be required for those units. Once a Contribution is made for a Unit, that Unit shall be completely released from all further obligations to contribute under this Section 3 without the need to record a release of the lien and
charge of this Agreement as to said Unit, and said Unit owner shall have no liability if Contributions are not timely made for other Units or any Developer obligations of this Agreement are not performed. If requested, the City agrees to sign and deliver to Developer, which Developer may cause to be recorded at its sole cost and expense, a release of lien required by a title company with respect to the sale of a Unit, provided that the form of the release of lien is acceptable to the City, in the City’s reasonable discretion.

3.3 Payment of Contributions. Each and every Contribution required by Section 3.2 above shall be paid to the City prior to the issuance of a building permit for that Unit. The City shall have the right to delay or deny the issuance of any and all building permits for a material default of this Agreement or deny or delay a building permit for any Unit for which the Contribution has not been paid until such time as the Contribution has been paid. For purposes of clarification, the approval of parcel maps, tentative maps, special use permits, records of survey, final subdivision maps, or approval of certificates of occupancy for Civic Uses within the Project shall not trigger the obligation to make Contributions hereunder.

3.4 Sale Proceeds. City shall receive full ownership of the Public Facility Site. If City determines it no longer has a municipal or government use for the site, it may sell all or a portion of the property. After January 1, 2028, City shall receive all proceeds from the sale. If such sale occurs prior to the January 1, 2028, Developer and the City shall equally share the net sales proceeds of the sale. As used herein, “net sales proceeds” means the gross sales price of the sale of the Public Facility Site, less reasonable brokerage commission and other reasonable closing costs which costs shall be split evenly between the City and the Developer. Notwithstanding the foregoing, Developer may, in its sole and absolute discretion, apply its portion of the proceeds from a sale occurring before January 1, 2028 to any remaining amounts
due under this Agreement. If the Developer applies its portion of the net sales proceeds during this time, such amount shall be credited toward either the applicable amount of One Million Five Hundred Thousand and No/100ths Dollars ($1,500,000.00) the Developer must pay to the City by January 1, 2023 (See Section 3.6) or the One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00) the Developer must pay to the City after January 1, 2023 but before January 1, 2028 (See Section 3.6 below).

3.5 Pre-paid Contributions. In its sole and absolute discretion and without any obligation whatsoever to do so, at any time Developer may pre-pay a Contribution to the City under this Agreement ("Pre-paid Contribution"). The Developer shall indicate to what obligation or to which Units the Pre-paid Contribution applies.

3.6 Increased Contributions. If, by January 1, 2023, the City has not collected One Million Five Hundred Thousand and No/100ths Dollars ($1,500,000.00) under the terms of this Agreement, the Developer shall process, at its sole cost and expense, an amendment to the PUD's which shall increase the Contributions required of Units within the PUD's to ensure the City receives an increase in total compensation to be the sum of One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00). If the City has not received this increased amount of One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00) by January 1, 2028 the Developer shall make a lump sum payment to the City for the difference between what the City has received and the One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00). If the Developer does not make this payment within thirty (30) days from this date, the City shall cease to issue all building permits within the PUD's. The City also reserves the right to pursue all other legal remedies.
3.7 **Certificate of Compliance.** Within thirty (30) working days after receiving a specific request from Developer and if all amounts due and payable under this Agreement have been paid and all other conditions have been satisfied, the City shall execute in recordable form, a Certificate of Compliance with the Agreement, which, when recorded in the official records of Washoe County shall indicate satisfaction of the obligations of the parties under this Agreement. A Release of Lien is different than a Certificate of Compliance and no recorded Release of Lien terminating the lien and charge upon a portion of Units shall operate to terminate any outstanding obligations of the Developer or the City, including any unperformed obligation of Developer to contribute for all other Units not subject to the recorded Release of Lien or to pay Contributions which have not been paid.

4 **COVENANTS RUNNING WITH THE LAND / ASSIGNMENT**

4.1 **Recordation.** In order to provide notice to bind all future owners of the property within the PUD's regarding obligations for Contributions specified in this Agreement, and to provide them with the benefits hereof, this Agreement shall be recorded, at Developers sole cost and expense, in the official records of Washoe County. The terms and provisions of this Agreement regarding Contributions shall constitute covenants running with the land for the Units, and no successor in interest to all or part of the Units shall assume Developer's obligations under Sections 2 or 3.1, unless the successor to Developer is assigned the obligation and expressly assumes the obligation, subject to City approval, as provided in Section 4.2 of this Agreement.

4.2 **Assignment of Agreement.** Developer may assign this Agreement, subject to the City's written approval of the assignee, which approval shall not be unreasonably withheld, provided that the approved assignee assumes the applicable obligations and duties of Developer
and is capable of performing such outstanding obligations and duties. In determining whether an assignee is capable of performing the outstanding obligations and duties of the Agreement, the City may consider, among other things, the assignee’s financial resources, past business and/or development history and/or any other matters which may impact the assignee’s ability to perform the outstanding obligations and duties contained in the Agreement.

4.3 Subordination. The parties agree that this Agreement, and all terms and conditions hereof, shall be junior to and subordinated to the recorded priority of all deeds of trust encumbering all or any portion of the Units which are recorded subsequent in time to this Agreement, provided any such deed of trust secures the payment of loan proceeds used to purchase or construct improvements which benefit the Units subject to subordination. Nothing contained in this Agreement grants any right nor imposes any obligation on a trustee or a beneficiary of a deed of trust encumbering all or any portion of the Units. Upon request, the City shall execute recordable subordination agreements consistent with the provisions of this Section.

5 TERM

Except as otherwise expressly provided herein, this Agreement shall terminate fifty (50) years from the date hereof or earlier upon the recordation of a Certificate of Compliance.

6 MISCELLANEOUS

The parties further agree as follows:

6.1 Governing Law; Venue. This Agreement is being executed and delivered in Washoe County, Nevada, and is intended to be performed in the State of Nevada, and the laws of Nevada shall govern the validity, construction, enforcement and interpretation of the Agreement. Venue for any legal action arising out of this Agreement shall be in a court of competent jurisdiction located in Washoe County, Nevada.
6.2 Entirely and Amendments. This Agreement embodies the entire agreement between the parties and supersedes all prior agreements and understandings relating to the subject matter hereof and may be amended or supplemented only by an instrument in writing executed by the party against whom enforcement is sought, provided that nothing contained in this Agreement shall be interpreted to change, amend or modify the conditions of the PUD's, as approved by the City. No oral statements or representations made before or after the execution of this Agreement regarding the subject matter of this Agreement are binding on a party, nor may any such oral statements or representations be relied on by a party.

6.3 Invalid Provisions. If any provision of this Agreement is held to be illegal, invalid or unenforceable under present or future laws, such provision shall be fully severable. The Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part of the Agreement. The remaining provisions of the Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid or unenforceable provision or by its severance from this Agreement.

6.4 Parties Bound and Assignment. Except as otherwise provided herein, this Agreement shall be binding upon and inure to the benefit of the parties, and their respective heirs, personal representatives, successors and assigns.

6.5 Further Acts. In addition to the acts recited in the Agreement to be performed, the parties agree to perform, or cause to be performed, any and all further acts as may be reasonably necessary to consummate the obligations contemplated hereby.

6.6 Headings. Headings used in this Agreement are used for reference purposes only and do not constitute substantive matter to be considered in construing the terms of this Agreement.
6.7 **Attorneys' Fees.** In the event that any action is necessary to enforce the rights of any party hereto, the prevailing party in any such action shall be entitled to reasonable costs and attorneys' fees.

6.8 **Notice.** All notices given pursuant to this Agreement shall be in writing and shall be given by personal delivery, by facsimile transmission, by United States mail or by United States express mail or other established express delivery service (such as Federal Express), postage or delivery charge prepaid, addressed to the appropriate party at the address set forth below:

**City:**
City of Reno
City Manager's Office
P.O. Box 1900
Reno, NV 89505
Telephone: (775) 334-2400
Facsimile: (775) 334-2097

**Copy to:**
City of Reno
City Attorney's Office
P.O. Box 1900
Reno, NV 89505
Telephone: (775) 334-2050
Facsimile: (775) 334-2420

**Developer:**
Corona Cyan LLC
Attn: Tony Koeijmans
RSF Partners
3232 McKinney, Suite 890, Dallas, TX 75204
Telephone: (214) 849-9819
Facsimile: (214) 855-9407

The persons and addresses to which notices are to be given may be changed at any time by any party upon written notice to the other party. All notices given pursuant to this Agreement shall be deemed given upon receipt.

6.9 **Receipt Defined.** For the purpose of this Agreement, the term "receipt" shall mean any of the following: (a) the date of delivery of the notice or other document as
6.12 **Counterparts.** This Agreement may be executed in one or more counterparts, each of which shall be deemed an original but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, each Party hereto has executed this Agreement as of the date opposite that Party’s signature.

CITY OF RENO

By: ROBERT A. CASHELL, SR.
Its: Mayor

Date: 11-14-12, 2012

ATTEST:

CITY CLERK

APPROVED AS TO LEGAL FORM:

CITY ATTORNEY

ACKNOWLEDGEMENT – NRS 240.1665

STATE OF NEVADA )
COUNTY OF WASHOE )

This instrument was acknowledged before me on this 14th day of November, 2012, by DAVID L. ALLSTON as VICE MAYOR of the City of Reno, a municipal corporation.
Corona Cyan LLC,
A Delaware limited liability company

By: [Signature]

Name: Tony Kegelmans
Title: Authorized Signatory

Date: 11/8, 2012

ACKNOWLEDGEMENT – NRS 240.1665

STATE OF Texas
COUNTY OF Dallas

This instrument was acknowledged before me on this 8th day of
Nov, 2012, by Tony Kegelmans

[Signature]

Authorized Signatory
of Corona Cyan LLC, a Delaware limited liability company.

[Notary Public Seal]

Eunice Ann Christman
Notary Public, State of Texas
My Commission Expires
March 24, 2015

12986197-4
CENTEX HOMES,
A Nevada General Partnership
By: Centex Real Estate Corporation, Nevada Corporation
Title: Division VP, Finance

ACKNOWLEDGEMENT - NRS 240.1665

STATE OF ________ )
COUNTY OF ________ ) ss

This instrument was acknowledged before me on this [-] day of 20__, by ________________________________
of Centex Homes, a Nevada General Partnership

Notary Public, State of ________
STATE OF CALIFORNIA
COUNTY OF ALAMEDA

On November 1, 2012, before me, Lesley A. Rosselli, Notary Public, personally appeared CHRISTOPHER WINTER, who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature: [Signature]
Print Name: Lesley A. Rosselli
Notary Public, State of California
My commission expires: March 28, 2013
EXHIBIT "A"

LEGAL DESCRIPTION OF THE PROJECT

EXHIBIT "A"

PARCEL B OF P.M. 4528
ORIGINAL (PHASE I OF) BELLA VISTA RANCH

All that certain real property situated within the a portion of the South One-half (1/2) of Section Three (3) and the north one-half (1/2) of Section Ten (10), Township 18 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel B as shown on that "Parcel Map For Bella Vista Ranch", recorded in the office of the Washoe County Recorder, March 10, 2006, as Parcel Map No. 4528, Document No. 3359887, Official Records of Washoe County, Nevada.

CONTAINING: 367.11 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.

JAMES G. BAILEY, JR.
Professional Land Surveyor
3601 E. PSYCHEDELLIC "B"
9/27/12

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES INCORPORATED
6250 FIELDSTONE PLACE
RENO, NEVADA 89523
(775) 321-7721

16
EXHIBIT "A"

PARCEL C OF P.M. 4526
PHASE II - BELLA VISTA RANCH
(APN: 182-011-00)

All that certain real property situated within the a portion of the South One-half (1/2) of Section Three (3) and the northeast one-quarter (1/4) of Section Ten (10), Township 16 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel C as shown on that "Parcel Map For Bella Vista Ranch", recorded in the office of the Washoe County Recorder, March 10, 2006, as Parcel Map No. 4526, Document No. 3359987, Official Records of Washoe County, Nevada.

CONTAINING: 77.37 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.

JAMES D. BAILEY JR.
Ex. 19-51-12

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES INCORPORATED
6250 PIEDMONT PLACE
RENO, NEVADA 89523
(775) 355-7721
EXHIBIT "B"

LEGAL DESCRIPTION OF PROJECT PUBLIC FACILITY SITE

EXHIBIT "A"

PARCEL B OF T.M. 4792
PUBLIC FACILITY PARCEL
(APN: 165-080-01)

All that certain real property situated within the portion of the northwest one-quarter (1/4) of Section Ten (10), Township 18 North, Range 26 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel B as shown on that "Official Plat Of Bella Vista Ranch Village B – Unit 1", recorded in the office of the Washoe County Recorder, June 20, 2007, as Tract Map No. 4792, Document No. 3548189, Official Records of Washoe County, Nevada.

CONTAINING 6.5 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.
EXHIBIT A-1
PARCEL B OF T.M. 4792
PUBLIC FACILITY PARCEL

APN: 165-080-01
6.50 ACRES TOTAL
EXHIBIT C

GRANT, BARGAIN AND SALE DEED

A.P.N. # [to be provided by Developer]

After recording, mail original and
tax Statements to:
City of Reno
C/O Property Manager
P.O. Box 1900
Reno, Nevada 89505

With a Conformed Copy to:
[Developer]

GRANT, BARGAIN and SALE DEED

THIS INDENTURE WITNESSETH: That [Developer], "Grantor", in consideration of $10.00,
the receipt of which is hereby acknowledged, does hereby Grant, Bargain, Sell and Convey to the
City of Reno, a municipal corporation, "Grantee", all that real property situate in the City of
Reno, County of Washoe, State of Nevada, bounded as described as follows:

See Exhibit "A" attached hereto and made a part hereof.

TO HAVE AND TO HOLD said premises, together with all and singular the rights and
appurtenances thereof to Grantee in fee simple. Developer has no reserved rights in the Park
Facility or the Park Site and Developer waives any first refusal rights it has under NRS 268.050,
or successor statutes.
Together with all and singular the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining including any mineral and water rights. Witness my hand this __________ day of __________________, 20__. 

Grantor:

[Developer]
By: ____________________________
[Insert Name, Title]

STATE OF TEXAS )
COUNTY OF __________ )

On ______________________, 20__, personally appeared before me, a Notary Public, ____________________________, personally known (or proved) to me the person(s) whose name is/are subscribed to the above instrument who acknowledged that he/she/they executed the within instrument.

Notary Public
Exhibit 1

to Grant, Bargain and Sale Deed

Legal Description

THE LAND REFERRED TO HEREBIN IS SITUATED IN THE COUNTY OF WASHOE,
STATE OF NEVADA, AND IS DESCRIBED AS FOLLOWS:

EXHIBIT "A"

PARCEL B OF T.M. 4782
PUBLIC FACILITY PARCEL,
(APN: 189-080-01)

All that certain real property situated within the a portion of the northwest one-quarter
(1/4) of Section Ten (10). Township 18 North, Range 20 East, Mount Diablo Meridian,
City of Reno, County of Washoe, State of Nevada, more particularly described as
follows:

Parcel B as shown on that "Official Plat Of Bella Vista Ranch Village B — Unit 1",
recorded in the office of the Washoe County Recorder, June 20, 2007, as Tract Map
No. 4782, Document No. 3546189, Official Records of Washoe County, Nevada.

CONTAINING: 6.50 acres of land, more or less.
See Exhibit "A-1" attached hereto, and made a part hereof.

[Stamp]

JAMES D. BAILEY JR.
Dep. 1254-92

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES CORPORATION
6259 FIELDSTONE PLACE
RENO, NEVADA 89523
(775) 355-7721
EXHIBIT A-1
PARCEL B OF T.M. 4792
PUBLIC FACILITY PARCEL
APN: 165-099-01
6.50 ACRES TOTAL
EXHIBIT D
DEVELOPER'S RELEASE AND AFFIDAVIT

I, ________, being first duly sworn, depose and say under penalty of perjury:

1. This Developer's Release and Affidavit is made pursuant to that certain Public Facility Site Agreement by and between the City of Reno ("City") and ____________ ("Developer"), dated ____________ (hereafter the "Agreement").

2. I am the ________ of ____________, the Developer. I am making this Affidavit individually and I am authorized to make this Affidavit and Release on behalf of ____________, the Developer. This Affidavit and the representations made herein are intended to be relied upon by the City in conjunction with the Closing of the Agreement, and shall survive the Closing.

3. I certify and warrant on behalf of myself and Developer that to the best of our information and belief after diligent inquiry, as of the date hereof, there are no actual or threatened legal claims, including but not limited to lawsuits, material man's claims, mechanics liens, wage claims, property claims, or claims by resident's of the PUD, against the City or the Public Facility Site arising out of the Agreement, or which may affect the City's interest in the Agreement or the Public Facility Site, except those expressly set forth below:
   a. [Describe any exceptions].

4. I certify and warrant on behalf of myself and Developer that Developer will indemnify, defend and hold City harmless from any claims against the City arising out of developer's obligations under the Agreement.

5. I certify and warrant on behalf of myself and Developer that Developer has no claims against the City arising out of the Agreement.

6. I certify and warrant on behalf of myself and Developer that Developer has not become aware of any Contamination or Hazardous Substances on or under the Public Facility Site, or on or under the surrounding lands which might possibly affect the Public Facility Site, which have not been previously disclosed or disclosed in writing to City.

7. 

8. I certify and warrant on behalf of myself and Developer that any applicable property taxes and utilities attributable to the Public Facility Site are fully paid and will be fully paid as of Closing.

THIS PORTION OF THIS PAGE HAS BEEN LEFT INTENTIONALLY BLANK
9. I certify and warrant on behalf of myself and Developer that all public utilities required to be brought up to the Public Facility Site abut the Public Facility Site through adjoining public streets or, if they pass through adjoining private lands, do so in accordance with valid public easements that will inure to the benefit of City upon Closing.

DEVELOPER

By: __________________________
Its: __________________________

STATE OF TEXAS )
COUNTY OF __________ )

This instrument was acknowledged before me on the _______ day of ________, 2012, by __________________________ of __________________________ (DEVELOPER).

Notary Public
Appendix H
Residential Construction Tax Agreement
ASSIGNMENT AND ASSUMPTION OF PARK DEVELOPMENT AGREEMENT & FIRST AMENDMENT AND RESTATEMENT OF PARK DEVELOPMENT AGREEMENT

THIS ASSIGNMENT AND ASSUMPTION OF PARK DEVELOPMENT AGREEMENT & FIRST AMENDMENT AND RESTATEMENT OF PARK DEVELOPMENT AGREEMENT (this "Assignment"), is entered into by and among the CITY OF RENO, a municipal corporation ("City"), CORONA CYAN, LLC, a Delaware limited liability company ("Corona"), and CENTEX HOMES, a Nevada general partnership ("Centex"). The City, Corona, and Centex are each individually referred to herein as a "Party" and collectively as the "Parties."

RECITALS:

A. On June 28, 2006, the City and Centex entered into a Park Development Agreement (the "Park Agreement"), which Park Agreement provides for the construction of a park in relation to that planned unit development ("PUD") in Reno, Nevada, commonly known as Bella Vista Ranch (City of Reno Case No. LDC05-00127) (hereafter "BVR");

B. Centex has sold, assigned, transferred, and conveyed unto Corona all of Centex's right, title and interest in and to BVR, the Park Agreement and other interests, including Centex's rights relating to the project described in Recital D below;

C. In connection with Corona's acquisition of BVR and the Park Agreement from Centex, the Parties desire that Centex further assign to Corona, and that Corona assume from Centex, all rights, obligations, and interests of Centex in and under the Park Agreement;

D. Corona, as the developer, is in the process of obtaining approval of that proposed PUD, adjacent to BVR, commonly known as Bella Vista Ranch Phase II (City of Reno Case No. LDC10-00051) (hereafter "BVR Phase II");

E. Corona and City desire to amend the Park Agreement by providing for the City to construct some or all of the park. To clarify their relationship, Corona and City desire to amend and restate the Park Agreement between them as set forth hereafter in this Assignment;

NOW, THEREFORE, in consideration of the mutual covenants contained herein and other valuable consideration, the receipt and adequacy of which are expressly acknowledged, the parties agree as follows:
1. **Assignment and Assumption.**

   (a) Centex hereby assigns, transfers and sets over unto Corona all of Centex’s right, title and interest in, under and to the Park Agreement.

   (b) Corona hereby accepts the foregoing assignment and assumes all of the liabilities and obligations of Centex under the Park Agreement.

2. **Consent to Assignment.** The City, in accordance with Section 9.8 of the Park Agreement, hereby (a) consents to the assignment effected hereby and (b) agrees to recognize Corona as “Owner” under the Park Agreement and thereby establishes direct privity of estate and privity of contract with Corona.

3. **Restatement of Park Agreement.** The Park Agreement is hereby restated and superseded in its entirety, except to the extent specific portions of the Park Agreement are referenced herein in this Assignment.

4. **Definitions.** The following definitions shall apply to this Assignment.

   a. **Director:** shall mean the Director of the City’s Parks Recreation and Community Services Department (“PRCS”), or the Director’s designee.

   b. **Improvements:** shall mean the improvements described in section 8, entitled Park Site Improvements, below.

   c. **Park Site:** shall mean that certain park site parcel of land described in the next subsection entitled Park Site Parcel, together with the related Improvements thereon.

   d. **Park Site Parcel:** shall mean that certain parcel of land containing approximately 14 acres, plus or minus, as set forth in Exhibit “A” to this Assignment.

   e. **PUD:** shall mean Planned Unit Development.

   f. **RCT:** shall mean Residential Construction Tax which is that certain tax created pursuant to Nevada Revised Statutes (“NRS”) 278.497 through 278.4987, as subsequently amended, and Reno Municipal Code (“RMC”) 18.14.401-18.14.406, as subsequently amended (collectively “Enabling Statutes”). RMC imposes a tax upon the construction of apartment houses, residential dwelling units and mobile home lots (collectively “Units”), and establishes a method for collection of the RCT to enable City to provide neighborhood parks and facilities for parks. RCT imposes one percent (1%) of the valuation of each building permit issued, or One Thousand Dollars ($1,000.00) per residential dwelling unit or mobile home, whichever is less.
5. **Transfer of Land.** Corona agrees to donate the Park Site Parcel to the City at no cost to the City by grant, bargain and sale deed in a form attached hereto as Exhibit “C” within 45 days following a request in writing from the City’s Director, which transfer shall occur prior to commencement of any construction by the City or within 30 days after the issuance of the 850th certificate of occupancy in BVR, whichever first occurs.

The Park Site Parcel shall be subject to a use restriction that for a period of 50 years the property shall be used solely as a city park, for related recreational purposes, and for telecommunications facilities that do not interfere with the park and recreation use and are camouflaged to minimize visual impact; and that after such time, the City, in its sole discretion, may sell or modify the use of the property provided the City Council finds at a hearing noticing all neighbors within 750 feet of the property that the proposed modification in use or sale of the property best serves the public interest. In the event of a transfer by the City, Corona hereby represents that it is reserving no right or claim in or to the Park Site Parcel and Corona, on behalf of itself and its successors and assigns, hereby waives any first refusal rights it has under NRS 268.050, or successor or similar statutes.

6. **Preliminary Title Commitment.** Thirty (30) days prior to transfer of the Parks Site Parcel to the City, Corona shall provide a preliminary commitment for an owner’s standard coverage ALTA policy of title insurance for the final Park Site Parcel from a reputable title company. Prior to acceptance of the Park Site Parcel by the City, Corona shall remove all title exceptions, monetary encumbrances, encroachments, and all exceptions to coverage which could have a material and negative impact on the City’s intended use of the Park Site (collectively “Encumbrances”), unless City accepts the Encumbrance in writing or unless the Encumbrance existed of record when the Park Agreement initially became effective. The cost of the preliminary report and title insurance, and any charges or fees related to escrow or transfer of the Park Site Parcel, shall be paid by Corona.

7. **Developer’s Affidavit.** At the time of transfer of the Park Site Parcel to the City, Corona shall provide City with an Affidavit substantially in the form of the Developer’s Affidavit attached hereto as Exhibit “B”.

8. **Park Site Improvements.** City agrees to construct the improvements to the Park Site generally as described in Exhibits “B” and “C” to the Park Agreement and generally as described in the BVR PUD Handbook description of park facilities; however, City may make reasonable modifications to the improvements, facilities, amenities and to their locations within the Park Site Parcel which are in the public interest and, if it is a major change, following review by the Recreation and Parks Commission (hereafter collectively, the “Improvements”).

Construction the Improvements shall take place in two phases, as provided in this section and section 9, hereafter. The first phase, to the extent it is constructed by the City, shall be designed and constructed consistent with both the City’s ability to provide maintenance for the first phase and with the City’s ability to fund construction with RCT
collected at that time from the BVR and the BVR Phase II PUD’s. Construction of the Improvements in the first phase, whether by the City or by Corona, will begin prior to or upon issuance of the 850th Certificate of Occupancy.

Construction of the second phase will begin when the City determines that it has the ability to provide maintenance for the completed park and that it has sufficient RCT from the BVR PUD and the BVR Phase II PUD to complete construction of the Improvements. Once construction by either City or Corona is commenced, construction shall be pursued diligently until completion of that phase.

9. Accelerated Park Site Improvements.

a. The City recognizes that Corona may desire to construct park improvements prior to the City's park construction schedule. If Corona chooses to exercise this option, Corona's construction of a portion of the Improvements shall relieve the City of any requirement to build park improvements in phase one referenced in the preceding section, but shall not relieve the City of the obligation to complete the overall contemplated park Improvements in the second construction phase described in section 8.

b. Corona shall initiate the process by forwarding a written proposal to the City which shall include its intention to exercise its option. A preliminary park plan design for the entire site shall be developed and approved by the City, prior to the City's approval of Corona's accelerated improvements proposal in order to coordinate Corona's improvements into the overall Park Site planning. The proposal shall include a description of Corona's desired site amenities, total estimated construction costs, and timing of construction.

c. Corona will be eligible to utilize RCT funds collected from the BVR and BVR Phase II PUD's for reimbursement following construction of the accelerated improvements. If sufficient RCT funds are not available from the BVR and BVR Phase II PUD's, when construction commences, Corona may choose to advance its own funds to complete the project. If it does so, City will agree to reimburse Corona from future collections of RCT funds from the BVR and BVR Phase II PUD's in the fund amount advanced by Corona to complete the accelerated park improvements. City shall have the right to inspect all relevant documents to verify cost claims. The maintenance and operation of the park parcel, including the accelerated improvements, shall be the sole responsibility of Corona until the Park Site Parcel is transferred to City ownership.

d. Prevailing Wage Laws shall be applicable to construction by Corona, as follows:

1) Indemnity. Corona and all Corona’s contractors and subcontractors shall comply with NRS 338.010 to 338.090, inclusive, and regulations adopted pursuant thereto (“Prevailing Wage Laws”), and be responsible for carrying out the requirements of such provisions. Corona shall, and hereby agrees to, unconditionally indemnify, reimburse, defend, protect and hold harmless City and its elective and appointive boards, commissions, officers, agents, attorneys,
consultants and employees, and all of their respective successors and assigns, from and against any and all claims, demands, suits and actions at law or in equity, and losses, liabilities, expenses, penalties, fines, orders, judgments, injunctive or other relief, and costs and damages of every kind, nature and description (including but not limited to attorneys' fees and court costs; with counsel reasonably acceptable to City), and administrative, enforcement or judicial proceedings, whether known or unknown, and which directly or indirectly, in whole or in part, are caused by, arise from, or relate to, or are alleged to be caused by, arise from, or relate to the failure to comply with any state or federal labor laws, regulations or standards in connection with this agreement, including but not limited to Prevailing Wage Laws.

(2) Wages. As provided in NRS 338.020, the hourly and daily rate of wages to be paid each of the classes of mechanics and workmen employed in connection with construction of the Improvements shall not be less than the rate of such wages then prevailing in Washoe County.

(3) Penalty. Pursuant to NRS 338.060, Corona agrees to and shall forfeit as a penalty to the City, the sums established and applicable pursuant to the NRS 338.080 for each calendar day or portion thereof that each workman employed in connection with the project is paid less than the rates designated in the above in Subsection (2) for any work performed under this Agreement by Corona or any subcontractors or agents of Corona; or is not reported to the labor commissioner and City as required pursuant to NRS 338.070.

(4) Withholding Payments. Notwithstanding any other provisions of the Assignment, the City may withhold payments of RCT sufficient to pay any reasonably threatened or likely expenses or fines relating to Prevailing Wage Law violations or claims resolution of the issue. If any prevailing wage expenses or fines are actually incurred or imposed, City may offset otherwise required payments from RCT, or pursue such amounts by any lawful means.

(5) Reporting, Recordkeeping and Investigations. Prior to commencement of construction, and thereafter as often as reasonably necessary, Corona and the Director shall meet and agree upon reasonable reporting and record-keeping procedures to enable the parties to comply with Prevailing Wage Law requirements.

10. Right of Access. Prior to transfer of the Park Site Parcel, the City shall have the reasonable right of access to the Park Site Parcel, upon reasonable notice to Corona, for the purpose of conducting surveys, soils tests, staking, inspections or any other activities reasonably related to planning, engineering or construction of the Improvements. City shall have this right even if Corona accelerates construction, as provided in the preceding section entitled Accelerated Park Site Improvements.

11. Residential Construction Tax. City shall be entitled to collect and retain all RCT from the BVR PUD and the BVR Phase II PUD, including amounts already collected; and Corona waives any rights to RCT under the Park Agreement or otherwise, except as set forth in paragraph 9 herein. Any RCT not used to construct the Park Site Improvements shall be available to the City to use within the City's Park District 4 for
any purpose authorized by the RCT Enabling Statutes, regardless of whether the RCT was collected from the BVR or BVR Phase II PUD’s.

12. Water. Corona shall ensure that at the time of conveyance of the Park Site Parcel to City, that City has sufficient water service to meet the needs of both phases of the completed park, including but not necessarily limited to irrigation, restroom and drinking needs. Corona shall secure “will serve” letters or other rights to water and ensure that water lines run to the boundary of Park Site Parcel. Effluent or nonpotable water may be provided for irrigation where the City deems such water to be consistent with public health.

13. Utilities: Corona shall ensure that infrastructure is in place to provide utility services to the boundary of the Park Site Parcel, including but not necessarily limited to, electricity, gas, cable, sewer and water.

14. Maintenance Prior to Transfer. Corona shall maintain the Park Site Parcel in good condition free and clear of hazards, dangerous conditions or substances, debris, dumping, digging, litter, garbage, weeds over 6 inches in height and noxious weeds until title is transferred to the City.

15. Maintenance After Transfer. Following the acceptance of the transfer of the Park Site Parcel to the City, the City shall be responsible for maintenance of the Park Site Parcel. Maintenance of improved portions of the park, whether by Corona or by the City shall be subject to the maintenance provisions contained in Exhibit “D” (“Scope of City Maintenance”) to the Park Agreement, as amended from time to time. Without limiting the preceding sentence, maintenance shall be to standards required by all applicable laws and ordinances and shall be at least equal to actual maintenance performed by City for similar parks. Following construction of any phase of Improvements, the improved portion of the Park Site shall be open to the public.

16. Owner’s Reservation of Rights. Notwithstanding the transfer of the Park Site Parcel, Corona reserves all mineral rights, but without right of entry on the surface of the Park Site, nor the right to drill, mine, store, explore or operate through the surface of the Park Site or within five hundred feet (500') from the surface of the Park Site. Corona further reserves unto itself all rights and benefits of wetlands wherever located, and any and all rights to change or modify the Wetlands Permit and/or mitigation program, including but not limited to the right to sell excess mitigation area from time to time. Additionally, Corona reserves all mineral rights, oil, gas and/or hydrocarbon rights, geothermal rights, and storm water runoff located or produced within the Park Site.

17. Corona’s Access and Use of Park Site. After transfer of the Park Site Parcel to the City, and conditioned upon the City’s written approval, Corona shall be granted the right to limited access to the Park Site for installation and maintenance of utilities and related facilities, for installation and maintenance of drainage and other facilities and equipment, for compliance with the Wetlands Permit, to adjust or relocate walls and/or fencing or otherwise to correct boundary discrepancies, to comply with drainage needs, to
fulfill any jurisdictional agency requirements, to extend, construct, connect to, and maintain utilities and drainage lines, and to accomplish any other tasks required of Corona. City’s approval for such access may be further conditioned upon, including but not limited to, requiring Corona to repair or replace any portions of the Park Site or Improvements that are altered or damaged as a result of Corona’s access and use of the Park Site. Corona shall not cause or allow utility vaults or pump stations to be placed on the Park Site without the City’s prior written approval.

18. **Default.** In the event Corona defaults in the performance of its obligations under this Assignment, City shall (subject to the provisions of the following section entitled Notice of Default) without limitation have any or all of the following nonexclusive remedies:

a. Stop issuing building permits in either the BVR PUD or the BVR Phase II PUD, or both;
b. Demand and receive transfer of the Park Site Parcel;
c. Avail itself of any other remedy allowed by law or equity.

19. **Notice of Default.** Prior to utilizing a remedy specified above, City shall deliver written notice of default to Corona specifying in detail the circumstances of Corona’s default, and Corona shall have thirty (30) days from the date of delivery of the notice to cure the default.

20. **Recording.** Corona, at its expense, shall record this Assignment, or a Memorandum of this Assignment approved in form by the Director, against all owners within the BVR PUD within thirty (30) days of execution by all Parties, and shall provide City with a conformed recorded copy.

21. **Indemnification of Owner.** Subject to the limitations of applicable law, and without waiving its statutory protections, City shall indemnify, protect, defend and hold harmless Corona and its successors, assigns, shareholders, officers, directors, employees, authorized agents, contractors and subcontractors from and against any and all liability, costs and expenses (including defense costs and legal fees), and claims, losses, liabilities, suits, or actions of any kind (collectively “Claims and Expenses”), for damages for bodily injury, death, personal injury or property damage, arising out of, relating to or as a result of any negligent acts or omissions of City or its officers, directors, employees, authorized agents, contractors or subcontractors in carrying out City’s obligations hereunder, except to the extent such Claims and Expenses are proximately caused by the negligence or willful misconduct of the parties indemnified or their agents, servants or independent contractors who are directly responsible to such indemnified parties.

22. **Indemnification of City.** Owner shall indemnify, protect, defend and hold harmless City and its governing board, employees, authorized agents, contractors and subcontractors, and their respective successors and assigns from and against any and all Claims and Expenses, for damages for bodily injury, death, personal injury or property damage, arising out of, relating to or as a result of any negligent acts or omissions of
Corona or its officers, directors, employees, authorized agents, contractors, or subcontractors in carrying out Corona's obligations hereunder, except to the extent such Claims and Expenses are proximately caused by the negligence or willful misconduct of the parties indemnified, or their agents, servants or independent contractors who are directly responsible to such indemnified parties.

23. Insurance. Prior to commencement of construction on the Park Site Parcel by Corona pursuant to paragraph 9 herein, Corona shall maintain liability insurance in an occurrence amount of at least one million dollars covering its indemnification, defense and hold harmless obligations under this Assignment, and naming the City as an additional insured, with the certificate of insurance providing that coverage for the City shall not be cancelled without 30 days prior notice to the City.

24. Defenses not Waived. The City does not waive, and intends to assert, any common law or statutory defenses available to it, including those in NRS Chapter 41.

25. Exigency. Time is of the essence of this Assignment.

26. Notice – Delivery. Any notices, requests or instructions by a party to be given to another party shall be given in writing, by personal delivery or are to be mailed by certified mail with return receipt requested, to the following addresses or by facsimile copy to the respective number set forth.

If to Corona:
Corona Cyn, LLC
c/o RSF Partners
3232 McKinney
Dallas, Texas 75204
Attention: Tony Koeijmans
FAX: 214-835-9407

If to City:
CITY OF RENO
c/o Director, Parks, Recreation and Community Services Dept.
P.O. Box 1900
Reno, Nevada 89505
Fax Number: (775) 334-2449

WITH COPY TO:
Reno City Attorney's Office
P.O. Box 1900
Reno, Nevada 89505
Fax Number: (775) 334-2420

A notice shall be effective on the date of personal delivery if personally delivered before 5:00 p.m. (local time), otherwise on the day following personal delivery, or two (2)
business days following the date the notice is postmarked, if mailed as set forth above or, if by facsimile, on the date of actual notice if received before 5:00 p.m. (local time) otherwise on the next business day. Any party may change the address to which notice is to be given to it by giving notice of such change of address in the manner set forth above for giving notice.

27. Entire Agreement. This Assignment contains the entire agreement between the parties hereto and supersedes any and all prior agreement, arrangements or understandings regarding the same subject matter as this Agreement, which are null and void.

28. Survival. The representations, covenants and agreements contained herein shall not be discharged or dissolved upon transfer of the Park Site Parcel, but shall survive the same.

29. Governing Law. This Assignment shall be constructed and enforced in accordance with the laws of the State of Nevada and venue for any such action shall be in Washoe County, Nevada.

30. Modification and Amendments. This Assignment may not be modified, amended, altered or changed in any respect whatsoever except by further agreement in writing, duly executed by the parties.

31. Successors and Assigns. This Assignment shall be binding upon and inure to the benefit of the parties hereto and their respective successors, subcontractors, personal representatives, and assigns; provided that no assignment of the rights or obligations of Corona shall take place by the mere transfer or title of all or any portion of BVR or BVR Phase II. Only an express, written assignment approved by City shall operate to assign any rights or obligations of Corona to a third party.

32. Consultation with Legal Counsel. The parties hereto acknowledge and agree that each has been given the opportunity to review this Assignment with legal counsel independently, and has the requisite experience and sophistication to understand, interpret, and agree to the particular language of the provisions hereof. The parties have equal bargaining power and intend the plain meaning of the provisions herein. In the event of any ambiguity in or dispute regarding interpretation of terms, the interpretation of this Assignment shall not be resolved by any rule of interpretation providing for interpretation against the party who causes the uncertainty to exist or against the draftsman.

33. Headings. The headings and captions used in this Assignment are for convenience and ease of reference only and shall not be used to construe, interpret, expand or limit the terms of this Assignment. All exhibits attached to this Assignment, all exhibits to the Park Agreement referenced herein, and the recitals at the front of this Assignment are incorporated fully herein by this reference.
34. Countparts and Signatures. This Assignment may be executed in a number of counterparts, the conglomeration of which shall constitute a complete agreement if signed by all parties hereto. The parties hereby warrant that the persons executing this Assignment are authorized to execute this Assignment and are authorized to obligate the respective parties to perform this Assignment. A facsimile or electronic signature on this Assignment shall be treated for all purposes as an original signature.

IN WITNESS WHEREOF, each Party hereto has executed this Assignment as of the date opposite that Party's signature.

CENTEX:

CENTEX HOMES, a Nevada general partnership
By: [Signature]
By: [Date: November 1st, 2012]
Its: [Division VP Finance]

CORONA:

Corona Cyan, LLC, a Delaware limited liability company
By: [Signature]
By: [Date: 11/8, 2012]
Print: [Name]
Its: [Authorized Signatory]

Signatures continued on next page.
THE CITY:

City of Reno,
a municipal corporation

By: Robert A. Cashell, Sr.
Its: Mayor

Date: 11-14-12, 2012

ATTEST:

City Clerk

APPROVED AS TO FORM:

Deputy City Attorney
On November 4, 2012, before me, Lesley A. Rosselli, Notary Public, personally appeared CHRISTOPHER WINTER, who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature: [Signature] (Seal)
Print Name: Lesley A. Rosselli
Notary Public, State of California
My commission expires: March 28, 2013
ACKNOWLEDGMENTS – NRS 240.1665

STATE OF NEVADA )
COUNTY OF WASHOE )

This instrument was acknowledged before me on this 14th day of October, 2012, by Robert A. Cashell, Sr., as Mayor, of the CITY OF RENO, a municipal corporation.

David L. Mazzu, Vice Mayor

(State of notarial officer)

STATE OF TEXAS )
COUNTY OF DALLAS ) ss.

This instrument was acknowledged before me on this 6th day of October, 2012 by Tony Koelmann, as Authorized Signatory of CORONA CYAN, LLC, a Delaware limited liability company.

Eunice Ann Christian
Notary Public, State of Texas
My Commission Expires March 24, 2015

(State of notarial officer)
Exhibit "A"

Bella Vista Ranch PUD Park Site Legal Description
[to be attached]
EXHIBIT "A"

PARCEL A OF T.M. 4792
NEIGHBORHOOD PARK
(APN: 165-011-18)

All that certain real property situated within the a portion of the northwest one-quarter (1/4) of Section Ten (10), Township 18 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel A as shown on that "Official Plat Of Bella Vista Ranch Village B -- Unit 1", recorded in the office of the Washoe County Recorder, June 20, 2007, as Tract Map No. 4792, Document No. 3546189, Official Records of Washoe County, Nevada.

CONTAINING: 14.24 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.
I, ____________, being first duly sworn, depose and say under penalty of perjury:

1. This Affidavit is made pursuant to that certain ASSIGNMENT AND ASSUMPTION OF PARK DEVELOPMENT AGREEMENT & FIRST AMENDMENT AND RESTATEMENT OF PARK DEVELOPMENT AGREEMENT by and between the City of Reno ("City"), CORONA CYAN, LLC, a Delaware limited liability company ("Developer") and CENTEX HOMES, a Nevada general partnership, dated __________ (hereafter the "Agreement").

2. I am the __________ of ____________, the Developer. I am making this Affidavit individually and I am authorized to make this Affidavit on behalf of ____________, the Developer. This Affidavit and the representations made herein are intended to be relied upon by the City in conjunction with the transfer of the Bella Vista Ranch Planned Unit Development ("PUD") Park Site Parcel, and shall survive the transfer.

3. I certify and warrant on behalf of myself and Developer that to the best of our information and belief after diligent inquiry as of the date hereof, there are no actual or threatened legal claims, including but not limited to lawsuits, material man's claims, mechanics liens, wage claims, property claims, or claims by residents of the Bella Vista Ranch PUD or the Bella Vista Ranch, Phase II PUD, against the City or the Park Site Parcel arising out of the Agreement, or which may affect the City's interest in the Agreement or the Park Site Parcel, except those expressly set forth below:

   a. [Describe any exceptions].

4. I certify and warrant on behalf of myself and Developer that Developer will indemnify, defend and hold City harmless from any claims against the City which are known as of the date hereof, but not disclosed and approved by the City, affecting the City's title to the Park Site Parcel.

5. I certify and warrant on behalf of myself and Developer that Developer has no claims against the City arising out of the Agreement except those expressly set forth below:

6. I certify and warrant on behalf of myself and Developer that to the best of our information and belief after diligent inquiry there are no Hazardous Substances on or affecting or likely to affect the Park Site except those expressly set forth below.
7. I certify and warrant on behalf of myself and Developer that any applicable property taxes and utilities attributable to the Park Site are fully paid as of the date hereof.

8. I certify and warrant on behalf of myself and Developer that all public utilities required for the operation of the Park have been provided and that they either abut the Park Site Parcel through adjoining public streets or, if they pass through adjoining private lands, do so in accordance with valid public easements that will inure to the benefit of City upon Closing.

DEVELOPER

By: [Signature]
Its: Authorized Signatory

STATE OF TEXAS
COUNTY OF DALLAS

This instrument was acknowledged before me on the 8th day of Nov., 2012, by [Signature], as Authorized Signatory of [Corporation/Entity].

NOTARY PUBLIC
EXHIBIT “C”
FORM OF GRANT DEED

A.P. #

After recording, mail to:
City of Reno
% Property Manager
P.O. Box 1900
Reno, Nevada 89505

Grant, Bargain, Sale Deed

THIS INDENTURE WITNESSETH: That CORONA CYAN, LLC, a Delaware limited liability company, Grantor, in consideration of good and valuable consideration, the receipt of which is hereby acknowledged, does hereby Grant, Bargain, Sell and Convey to the City of Reno, a Nevada municipal corporation, Grantee, all that real property situate in the City of Reno, County of Washoe, State of Nevada, bounded and described as follows:

See Exhibit A attached hereto and made a part thereof.

TO HAVE AND TO HOLD said premises, together with all singular the rights and appurtenances thereof to Grantee, in fee simple, together with all and singular the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining, excepting any mineral and water rights;

And subject to a use restriction that for a period of 50 years from recording, the property shall used solely as a city park, for related recreational purposes, and for telecommunications facilities that do not interfere with the park and recreation use and are camouflaged to minimize visual impact; and that after such time, the City, in its sole discretion, may sell or modify the use of the property provided the City Council finds at a hearing noticing all neighbors within 750 feet of the property that the proposed modification in use or sale of the property best serves the public interest.

CORONA CYAN, LLC waives any first refusal rights it has under NRS 268.050, or successor or similar statutes.

Witness my hand this ___ day of ______, 20__.
On __________________, 20__, personally appeared before me, a Notary Public, personally known (or proved) to me to be the person(s) whose name is/are subscribed to the above instrument who acknowledged that he/they executed the within instrument.