Geo-Logic
ASSOCIATES

January 15, 2019
Project PA18.1042.00

Yat Cho
City of Morgan Hill
17575 Peak Avenue
Morgan Hill, California 95037

Subject: Geotechnical Update, Proposed Morgan Hill Centennial Recreation Center Expansion, 171 West Edmundson Avenue, Morgan Hill, California

Dear Mr. Cho,

This letter presents our updated geotechnical findings, conclusions, and recommendations for the proposed Morgan Hill Centennial Recreation Center (CRC) Expansion project. In November 2003, our firm (formerly as Pacific Geotechnical Engineering) prepared a geotechnical investigation report for the original Centennial Recreation Center project. Our representatives also observed and tested during earthwork and foundation construction of the original center. The following documents were previously prepared by our firm for the CRC project.

- A report titled "Geotechnical Investigation, Morgan Hill Recreational Center, Edmundson Avenue, Morgan Hill, California," dated November 24, 2003
- A letter titled "Backfill of Storm Drain Excavation next to Foundation, New Indoor Recreation Center Building, Morgan Hill Indoor Recreation Center, 171 West Edmundson Avenue, Morgan Hill, California," dated September 19, 2005
- A letter titled "Foundation Excavations for new Indoor Recreation Center Building, Morgan Hill Indoor Recreation Center, 171 West Edmundson Avenue, Morgan Hill, California," dated September 2, 2005
- A letter titled "Storm Drain Excavations for New Indoor Recreation Center Building, Morgan Hill Indoor Recreation Center, 171 West Edmundson Avenue, Morgan Hill, California," dated August 24, 2005
- A letter titled "Field Density Testing Report, Morgan Hill Indoor Recreation Center, 171 West Edmundson Avenue, Morgan Hill, California," dated July 5, 2005

1. PROPOSED PROJECT

The project will involve construction of an approximately 4,000-square-foot building expansion in the southeastern portion of the existing CRC building. Other improvements will include two new parking lots, a stormwater basin expansion, underground utilities, exterior flatwork, and landscaping. The stormwater basin expansion will be located east of the existing basin on the east side of the existing CRC building. One of the new parking lots will be located southeast of the CRC expansion building and the other new parking lot will be located east of the existing parking lot north of the existing CRC building.

Our review of the preliminary grading plans for the project indicates construction of the new building pad for the CRC expansion would require about 1 foot of cuts and fills. Construction of new parking lots would require ab out 1 to 2 feet of cuts and fills.

2. INFORMATION PROVIDED

The following information was provided to us for this study.

1. Sheet A1.0 (Overall Site Plan), Sheet A1.1 (Existing and Demo Site Plan), and Sheet A1.2 (Enlarged Site Plan), prepared by Weston Miles Architect, dated July 5, 2018.

2. Sheet C1.0 (Site Topography Map and Demo Plan), Sheet C1.1 (Grading & Utility Plan, Site Improvements North), and Sheet C1.2 (Grading & Utility Plan, Site Improvements South), prepared by MH Engineering Company, dated June 25, 2018.

3. PURPOSE AND SCOPE OF SERVICES

The purpose of our work was to update our 2003 geotechnical report, in particular the California Building Code (CBC) seismic design parameters, liquefaction assessment, and geotechnical recommendations for the proposed additions. The following work was performed for this geotechnical update.

1. Performed a site reconnaissance to observe existing site surface conditions.

2. Reviewed our 2003 geotechnical report and other documents related to the CRC project.

3. Collected 2 bulk soil samples from the proposed parking lot areas.

4. Performed laboratory R-value tests on the bulk samples.

5. Developed the seismic design parameters and peak ground acceleration based on the 2016 CBC requirements.

6. Performed a liquefaction assessment based on the current building code peak ground acceleration value.

7. Updated our geotechnical recommendations for the CRC expansion.

8. Prepared this geotechnical update letter.

4. FINDINGS

4.1 Site Surface Conditions

The site of the proposed CRC building addition is in the southeastern portion of the existing CRC building. Ground surface across the project area is essentially flat-lying and covered with grass.

The site of the southern proposed parking lot is currently vacant, generally flat-lying, and covered with bark. The site of the northern proposed parking lot is also vacant, generally flat-lying, and covered with bark with local trees and overhead solar power arrays.

4.2 Anticipated Subsurface conditions

No subsurface exploration was performed for this update. The information below is based on subsurface exploration performed during our 2003 geotechnical investigation which included a total of nine exploratory drill holes (DH-1 through DH-9). Drill hole DH-2 was located close to the proposed CRC expansion area. The depths mentioned below are in reference to the existing ground surface at the time of our exploration in October 2003.

In drill hole DH-2, a layer of very stiff lean clay of low plasticity was encountered to a depth of about 3 feet below ground surface (bgs). This lean clay was underlain by very stiff clay with sand to the maximum explored depth of about 10 feet bgs.

Our drill hole DH-1 was advanced to a depth of about 40 feet bgs. In this hole, the upper soils consist of layers of very stiff to hard clay, sandy silty clay, and sandy lean clay to a depth of about 17.5 feet bgs. These clays were underlain by a layer of hard fat clay to a depth of about 29 feet bgs, and dense to very dense clayey sand and clayey sand with gravel to the maximum explored depth of 40 feet bgs.

4.3 Groundwater

Groundwater was reported in DH-1 at a depth of about 27 feet at the time of our drilling in October 2003. About 6 hours later, the groundwater level rose to about 24 feet bgs.

Our review of regional information on depth to first groundwater from the Santa Clara Valley Water District website indicates that shallowest groundwater in the area as of 2003 could be between 0 and 10 feet bgs.

It should be noted that fluctuations in the groundwater level may occur due to seasonal variations in rainfall and temperature, pumping from wells, regional groundwater recharge program, irrigation, or other factors that were not evident at the time of our investigation.

4.4 Variations in Subsurface Conditions

Our interpretations of soil and groundwater conditions, as described in this letter, are based on data obtained from our 2003 subsurface exploration and laboratory testing. Our conclusions and geotechnical recommendations are based on these interpretations. The project site has undergone previous development and grading, therefore, it is likely that undisclosed variations in subsurface conditions exist at the site, such as old foundations, abandoned utilities, and areas of deep and loose fill.

Careful observations should be made during construction to verify our interpretations. Should variations from our interpretations be found, we should be notified to evaluate whether any revisions should be made to our recommendations.

4.5 Seismic Sources

The San Francisco Bay Area is seismically dominated by the active San Andreas Fault system, the tectonic boundary between the northward moving Pacific Plate (west of the fault) and the North American Plate (east of the fault). This movement is distributed across a complex system of generally strike-slip, right-lateral, subparallel faults.

Regional faults that have a potential to generate large magnitude earthquakes and significant ground shaking at the site are listed below. Map distances are derived from the USGS Quaternary Fault and Fold database (http://earthquake.usgs.gov/regional/qfaults/).

Table 1: Name, Distance and Orientation of Earthquake Faults from Site

Fault Name	Approximate Distance (km)	Orientation from Site
Calaveras (central section)	7 km	Northeast
Sargent	10½ km	Southwest
San Andreas (Santa Cruz Mts.)	14 km	Southwest
San Gregorio	54 km	Southwest

The project site is not located within a Santa Clara County Fault Rupture Hazard zone.

4.6 Ground Motions and Seismicity

According to the 2016 CBC and ASCE 7-10, the spectral response acceleration at any period can be taken as the lesser of the spectral response accelerations from the probabilistic and deterministic ground motion approaches. We used the US Seismic Design Maps Application at the United States Geological Survey (USGS) website to determine the seismic design parameter values for design of buildings at the subject site. Two levels of ground motions are considered in the Application: Risk-targeted Maximum Considered Earthquake (MCE_R) and Design Earthquake (DE), with both probabilistic and deterministic values defined in terms of maximum-direction rather than geometric-mean, horizontal spectral acceleration. The probabilistic MCE_R

spectral response accelerations are represented by a 5 percent damped acceleration response spectrum having a 1 percent probability of collapse within a 50-year period and in the direction of the maximum horizontal response. The probabilistic Design Earthquake (DE) S_a value at any period can be taken as two-thirds of the MCE_R S_a value at the same period.

Using the Seismic Design Maps application available from the California Structural Engineers Association website, the latitude and longitude of the site (latitude 37.113217^{o}N, longitude -121.645713^{o}W), and a Site Class C, the calculated geometric mean peak ground acceleration adjusted for site class effects (PGA_M) is 0.56g for the MCE_G (Geometric Mean Maximum Considered Earthquake). PGA_M is for use in evaluation of soil liquefaction, lateral spreading, seismic settlements, and other soil issues per ASCE 7-10. A Site Class C was used based on regional USGS data and subsurface information from our 2003 drill holes.

The Working Group on California Earthquake Probabilities' (WGCEP) estimates of the probabilities of major earthquakes are now in their sixth iteration, with the greatest changes in approach being the inclusion of multi-fault rupture scenarios, in the progressive consideration of more potential seismic sources, the possibility of earthquakes on unrecognized faults, and the inclusion of the notion of fault "readiness". Current estimates (WGCEP, 2014) for the San Francisco region indicate a 72% probability of a large (magnitude 6.7 or greater) earthquake in the San Francisco Bay area as a whole over the 30-year period beginning in 2014; this overall probability is greater than the previous (WGCEP, 2007) probability of 63%, due mainly to the inclusion of multi-fault rupture scenarios. The estimate for the Calaveras fault alone is 14.4% (revised up from the 7% presented by WGCEP, 2007); for the (northern) San Andreas fault alone, 27.4% (revised upward from the WGCEP (2007) value of 21%); and for the Hayward fault, 45.3% (revised upward from the WGCEP (2007) value of 31%).

4.7 Liquefaction

Soil liquefaction is a phenomenon in which saturated granular soils, and certain fine-grained soils, lose their strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. Soils most susceptible to liquefaction are saturated, clean, loose, fine-grained sands and non-plastic silts. Certain gravels, plastic silts, and clays are also susceptible to liquefaction. The primary factors affecting soil liquefaction include: 1) intensity and duration of seismic shaking; 2) soil type; 3) in-place relative density of granular soils; 4) moisture content and plasticity of fine-grained soils; 5) overburden pressure; and 6) depth to ground water.

The project site is not located in a Santa Clara County Liquefaction Hazard zone. Therefore, the potential for liquefaction at the site is considered to be low. This is reasonable because cohesive clayey soils were encountered below ground surface to a depth of about 29 feet and dense to very dense clayey sand was encountered from 29 to 40 feet bgs.

4.8 Seismic Design Parameters

The following site coefficients and seismic ground motion parameters are developed using the USGS Seismic Design Maps Application, the latitude and longitude of the site, and a Site Class C based on regional USGS information and data from our 2001 drill holes.

Parameter	Value - ASCE 7
Site Class	C
Site Coefficient F_a	1.0
Site Coefficient F_v	1.3
S_S	1.5g
S_1	0.6g
S_{Ms}	1.5g
S_{M1}	0.78g
S_{Ds}	1.0g
S_{D1}	0.52g

5. CONCLUSIONS AND DISCUSSION

5.1 Surface Fault Rupture

Because the project site is not located in a State of California Earthquake Fault Zone or a Santa Clara County Fault Rupture Hazard zone and no mapped active faults are known to cross the site, the probability of ground surface rupture at the project site is low.

5.2 Seismic Ground Shaking

The project site is located in an area of high seismicity. Based on general knowledge of the site seismicity, it should be anticipated that, during their useful life, the proposed additions will be subject to at least one severe earthquake (magnitude 7 to 8+) that could cause considerable ground shaking at the site. It is also anticipated that the site will periodically experience small to moderate magnitude earthquakes.

5.3 Soil Expansion Potential

The results of an Atterberg Limits test performed during our 2003 investigation on a sample of the near-surface soil in DH-1 at the CRC site indicate the soil has a low plasticity which generally corresponds to low expansion potential. Therefore, the potential for soil expansion to affect the building foundation and slab is low.

5.4 Compressible Soils

The subsurface soils encountered in our 2003 drill holes consisted of stiff to hard clays and medium dense to very dense sands. Compressibility of these soils is generally low for the anticipated loads of the proposed building addition.

5.5 Potential Differential Settlements between Addition and Existing Building

The existing CRC building was constructed around 2005 on shallow footing foundations. For the last 13 to 14 years, the existing building should have gone through settlement under the existing building loads. The CRC addition will experience settlement under its own building loads. If the CRC expansion is structurally connected to the existing building, there is a potential for differential settlement between the addition and the existing building which may cause distress and damage, such as cracking and separation, between the new and existing structures.

If the potential for differential settlement between the addition and the existing building is acceptable to the owner, the addition may be constructed on conventional footing foundations. If it is desirable to reduce the potential differential settlement between the building addition and the existing CRC building, consideration should be given to supporting the addition on drilled pier foundations. Recommendations for foundation design are provided in the following sections.

6. RECOMMENDATIONS

The following recommendations are for design and construction of the proposed CRC building expansion project. These recommendations supersede those in our 2003 report.

6.1 Earthwork

6.1.1 Clearing and Stripping

Site clearing should include removal of designated deleterious materials, debris, and obstructions, including designated structures, foundations, concrete slabs, pavements, utilities, and landscaping. Stumps and primary roots of trees and brush, where present, should be removed. Roots about 1 inch or larger in diameter or about 3 feet or longer in length should be removed. Depressions, voids, and holes that extend below proposed finish grade should be cleaned and backfilled with engineered fill compacted to the recommendations below. The backfill operations should be observed and tested by the project Geotechnical Engineer.

Surface vegetation should be stripped to sufficient depth to remove the vegetation and organic-laden topsoil. Organic laden soils are defined as soils with more than 3 percent by weight of organic content. Stripped material may be stockpiled for use in future landscape areas if approved by the project landscape architect; otherwise, it should be removed from the site. For planning purposes, an average stripping depth of 3 inches may be assumed in vegetation areas. The actual stripping depth should be determined by the Geotechnical Engineer at the time of construction.

6.1.2 Excavations and Temporary Construction Slopes

Excavations for this project are expected to include demolition excavations, cuts to achieve design grades, trenching to construct new underground utilities, and foundation excavations. Excavation walls in clayey soil and less than 5 feet in height should be able to stand near vertical with minimal bracing, provided proper moisture content in the soil is maintained. Granular soils, with little or no cohesion, will require more extensive bracing or laying back because they are prone to sudden collapse. Excavations and temporary construction slopes should be constructed in accordance with the current CAL-OSHA safety standards and local jurisdiction. The stability and safety of excavations, braced or unbraced, is the responsibility of the contractor.

Trench excavations adjacent to existing or proposed foundations should be above an imaginary plane having an inclination of 1½:1 (horizontal to vertical) extending down from the bottom edge of the foundations.

6.1.3 Over-excavation and Re-compaction of Surface Soil

After clearing and stripping, areas to receive engineered fills, foundations, concrete slabs-on-grade, and pavements should be over-excavated to a depth of at least 1 foot below the stripped surface ground surface. The soil surface exposed by over-excavation should be properly prepared as recommended below under "Subgrade Preparation." After the subgrade has been prepared, the excavation may be raised to design grade with engineered fill.

6.1.4 Subgrade Preparation

Subgrade soil in areas to receive engineered fills, foundations, concrete slabs-on-grade, and pavements should be scarified to a depth of at least 12 inches, moisture-conditioned, and compacted to the recommendations given under the "Engineered Fill Placement and Compaction" section below. Prepared soil subgrades should be non-yielding. Subgrade preparation should extend at least 5 feet beyond the building addition limits and at least 3 feet beyond the limits of the pavement areas unless it is restricted by existing structures or improvements.

Moisture conditioning of subgrade soil should consist of adding water if the soil is too dry or allowing the soil to dry if the soil is too wet. After the subgrades are properly prepared, the areas may be raised to design grades by placement of engineered fill.

Soil with moisture content above optimum value should be anticipated in unpaved areas, under existing pavements and concrete slabs, during and after the rainy months. Unstable, wet or soft soil will require processing before compaction can be achieved. If construction schedule does not allow for air-drying, other means such as lime or cement treatment of the soil or excavation and replacement with suitable material may be considered. Geotextile fabrics or geogrids may also be used to help stabilize the subgrade. The method to be used should be determined at the time of construction based on the actual site conditions. We recommend obtaining unit prices for subgrade stabilization during the construction bid process.

6.1.5 Materials for Engineered Fills

In general, on-site soils with an organic content of less than 3 percent by weight, free of any hazardous, debris or deleterious materials, and meeting the gradation requirements below may be used as engineered fill to achieve project grades, except when special material (e.g. capillary break material) is required.

In general, engineered fill material should not contain rocks or lumps larger than 3 inches in greatest dimension, should not contain more than 15 percent of the material larger than 1½ inches, and should contain at least 20 percent passing the No. 200 sieve. In addition to these requirements, import fills should have a low expansion potential as indicated by Plasticity Index of 15 or less, or Expansion Index of less than 20.

All import fills should be approved by the project Geotechnical Engineer prior to delivery to the site. At least five (5) working days prior to importing to the site, a representative sample of the proposed import fill should be delivered to our laboratory for evaluation.

6.1.6 Engineered Fill Placement and Compaction

Engineered fill should be placed in horizontal lifts each not exceeding 8 inches in loose thickness, moisture conditioned to the required moisture content, and mechanically compacted to the recommendations below. Relative compaction or compaction is defined as the in-place dry density of the compacted soil divided by the laboratory maximum dry density as determined by ASTM Test Method D1557, latest edition, expressed as a percentage. Moisture conditioning of soils should consist of adding water to the soils if they are too dry and allowing the soils to dry if they are too wet.

Engineered fills should be compacted to at least 90 percent relative compaction with moisture content between about 1 and 3 percent above the laboratory optimum value.

In pavement areas, the upper 6 inches of subgrade soil should be compacted to at least 95 percent relative compaction with moisture content between 1 and 3 percent above the optimum value. Aggregate base should be compacted at slightly above the optimum moisture content to a minimum of 95 percent relative compaction.

6.1.7 Utility Trench Backfill

Construction of underground utility trenches should comply with the City of Morgan Hill standards, latest edition. In general, pipe bedding, extending from the bottom of the trench to about 1 foot above the top of pipe, may consist of free-draining sand (less than 5% passing a No. 200 sieve), lean concrete or sand cement slurry. Sand bedding should be compacted to a minimum of 90 percent relative compaction.

Above the pipe bedding, utility trenches may be backfilled with on-site soil or imported soil. Trench backfill above the pipe bedding should be compacted to the requirements given in the section of "Engineered Fill Placement and Compaction." Trench backfill should be capped with at least 12 inches of compacted, on-site soil similar to that of the adjoining subgrade. The backfill material should be placed in lifts not exceeding about 6 inches in uncompacted thickness. Thinner lifts may be necessary to achieve the recommended level of compaction of the backfill due to equipment limitations. Compaction should be performed by mechanical means only. Water jetting or flooding to attain compaction of backfill should not be permitted.

For trenches crossing the building perimeter, the full depth of the trenches within 2 feet on both sides of the perimeter foundations should consist of compacted clayey soil to reduce the potential for water infiltrating to under the building.

6.1.8 Wet Weather Construction

If site grading and construction is to be performed during the winter rainy months, the owner and contractors should be fully aware of the potential impact of wet weather. Rainstorms can cause delay to construction and damage to previously completed work by saturating compacted pads or subgrades, or flooding excavations. The potential for high groundwater during and after the winter rainy months would also affect construction of the project.

Earthwork during rainy months will require extra effort and caution by the contractors who should be responsible to protect their work to avoid damage by rainwater. Standing water should be pumped out immediately. Construction during wet weather conditions should be addressed in the project construction bid documents and/or specifications. We recommend the grading contractor submits a wet weather construction plan outlining procedures they will employ to protect their work and to minimize damage to their work by rainstorms.

6.2 Building Foundations

Footing foundations may be used to support the CRC building addition if the addition is not structurally connected to the existing CRC building or if potential differential settlement between the CRC building addition and the existing CRC building is acceptable to the owner. A structural mat foundation should be used for support of the CRC building addition if the effects of potential differential settlement between the CRC building addition and the existing CRC building are to be reduced.

To maintain the desired support, the bottom of foundations adjacent to utility trenches or buried structures should be below an imaginary plane having an inclination of 1.5 horizontal to 1 vertical, extending upward from the bottom edge of the adjacent utility trenches or structures. If the foundations are closer than the recommended distance, the project Geotechnical Engineer should be consulted for recommendations.

6.2.1 Conventional Footings

Footings, continuous and isolated, may be used to support the proposed CRC addition. Footings should bear on undisturbed native soil and/or properly compacted engineered fill. Preparation of soil subgrade, moisture conditioning, and compaction of soil and engineered fill should be as recommended in the “Earthwork” section of this report.

Footings may be designed for a net allowable bearing pressure of 1,500 pounds per square foot due to dead plus live loads, with a one-third increase when including transient loads such as wind or seismic. The footing bottom should extend at least 18 inches below pad grade or lowest adjacent finish grade, whichever provides a deeper embedment. Footings should be at least 12 inches wide. Footings should be reinforced as designed by the Structural Engineer.

Resistance to lateral loads may be developed from a combination of friction between the bottom of foundations and the supporting subgrade, and by passive resistance acting against the vertical sides of the foundations. Footings bearing on native soil or engineered fill may be designed using an ultimate friction coefficient of 0.3 between the foundations and supporting subgrade, and an ultimate passive resistance of 300 pounds per cubic foot (pcf, equivalent fluid weight) acting against the embedded sides of the foundations. The passive pressure can be assumed to act starting at the top of the lowest adjacent grade in paved areas. In unpaved areas, the passive pressure can be assumed to act starting at a depth of 1 foot below grade. It should be noted that the passive resistance value discussed above is only applicable where the concrete is placed directly against undisturbed soil or engineered fills. Voids created by the use of forms should be backfilled with property compacted engineered fill or with concrete.

Total post-construction settlement of the foundations is anticipated to be up to about 3/4 inch, with up to about 3/8 inch of differential settlement over a distance of about 30 feet.

6.2.2 Drilled, Cast-in-place, Reinforced Concrete Piers

The proposed CRC addition may be supported on drilled, cast-in-place, reinforced concrete piers designed to derive their vertical supporting capacity from “skin friction” between the pier shafts and the surrounding earth materials. Piers should have a diameter of 12 inches or greater and should extend at least 8 feet below the ground surface. Center to center spacing of the piers should be a minimum of 3 pier diameters. Reinforcement in the piers should be determined by the structural engineer.

For dead plus live vertical loads, a net allowable adhesion value of 500 pounds per square foot may be assumed along the pier shafts. This value may be increased by one-third when including transient loads, such as wind or seismic. The upper 1 foot of the piers below lowest adjacent finish grade should be neglected when calculating vertical pier capacity. End bearing capacity should also be ignored.

Resistance to lateral loads may be calculated based on passive soil pressure acting against the piers. For dead plus live loads, the ultimate passive resistance in soil or engineered fill may be calculated using an equivalent fluid weight of 300 pounds per cubic foot acting on 2 times the pier diameter, for level ground surface in front of the piers in the direction of load application. The upper 1 foot of soil below lowest adjacent finish grade should be ignored in the calculation of passive pressure. It should be noted that passive resistance is only applicable where the concrete is placed directly against undisturbed soil or engineered fill.

Perimeter piers should be structurally tied with grade beams for the foundation to act as one structural unit. Grade beams should be designed to span between piers and should be embedded at least 12 inches below pad grade.

Prior to placement of reinforcing steel and concrete, the pier holes should be cleaned of loose soil and debris. If water is encountered in the pier holes, concrete should be placed using the "tremie" method to displace the water to the surface.

The Geotechnical Engineer should observe during drilling of the foundation piers to evaluate whether the pier holes are in suitable bearing material.

6.3 Concrete Slabs-on-grade

The building floor slab should be constructed on properly moisture-conditioned and compacted subgrade soil complying with recommendations in the "Earthwork" section above. Slab subgrades should be maintained in a moist condition prior to placement of slab concrete. Design of slab reinforcement, joint spacing, etc. is the responsibility of the structural engineer.

Interior concrete slabs-on-grade that will be covered with floor coverings or where vapor transmission through the slabs is undesirable should be underlain by at least 4 inches of capillary break material such as free-draining, clean drain rock or 3/8 inch pea gravel. A visqueen should be placed over the capillary break material. The visqueen should be a high quality polymer at least 10 mils thick that is resistant to puncture during slab construction. Typically, the membrane and the slab are separated by 2 inches of sand; but the use of sand should be determined by the project structural engineer.

A lower water-cement ratio (0.45 to 0.50) will also help reduce the permeability of the floor slab. It should be understood that the recommended plastic membrane is not intended to waterproof the concrete slab floor. If waterproofing is desired, the project designers and/or a flooring expert should be contacted.

6.4 Pavements

The two new parking lots are expected to accommodate primarily automobiles and light pickup trucks, with occasional heavy vehicles, such as delivery and garbage trucks. An R-value of 29 was measured on both bulk samples collected from the two parking lot areas. For design purposes, an R-value of 25 was used to calculate the pavement sections tabulated below using the Caltrans pavement section design procedures.

DESIGN TRAFFIC INDEX	HOT MIX ASPHALT (inches)	CLASS 2 AGGREGATE BASE (inches)	TOTAL (inches)
5.0	3.0	6.0	9.0
5.5	3.0	7.5	10.5
6.0	3.5	8.0	11.5
6.5	3.5	9.5	13.0
7.0	4.0	10.0	14.0

Pavement sections should be constructed on soil subgrades that have been prepared as outlined in the “Earthwork” section of this report. The upper 8 inches of soil subgrade in pavement areas should be compacted to a minimum of 95 percent relative compaction. The full section of aggregate base and aggregate subbase should be compacted to a minimum of 95 percent relative compaction. Evaluation of relative compaction should be based on ASTM D1557, latest edition. The Class 2 Aggregate Base material should conform to Section 26 of the Caltrans Standard Specifications and the Class 2 Aggregate Subbase material should conform to Section 25 of the Caltrans Standard Specifications.

6.5 Surface Drainage

Engineering design of grading and drainage at the site is the responsibility of the project Civil Engineer. We recommend the following for consideration by the project Civil Engineer.

Sufficient surface drainage should be provided to direct runoff away from structures, foundations, concrete slabs-on-grade, and pavements, and towards suitable collection and discharge facilities. Ponding of surface water should be avoided by establishing positive drainage away from all improvements. Water collected should be discharged at a suitable discharge point.

7. LIMITATIONS

In preparing the findings and professional opinions presented in this letter, Geo-Logic Associates (GLA) has endeavored to follow generally accepted principles and practices of the geotechnical engineering professions in the area and at the time our services were performed. No warranty, express or implied, is provided.

The conclusions and recommendations contained herein are based, in part, on information that has been provided to us. In the event that the general development concept or general location and type of structures are modified, our conclusions and recommendations shall not be considered valid unless we are retained to review such changes and to make any necessary additions or changes to our recommendations. To remain as the project geotechnical engineer-of-record, GLA must be retained to provide geotechnical services during construction of the project.

Should conditions different from those described in this letter be encountered during project development and construction, GLA should be consulted to review the conditions and determine whether our recommendations are still valid. Additional exploration, testing, and analysis may be required for such evaluation.

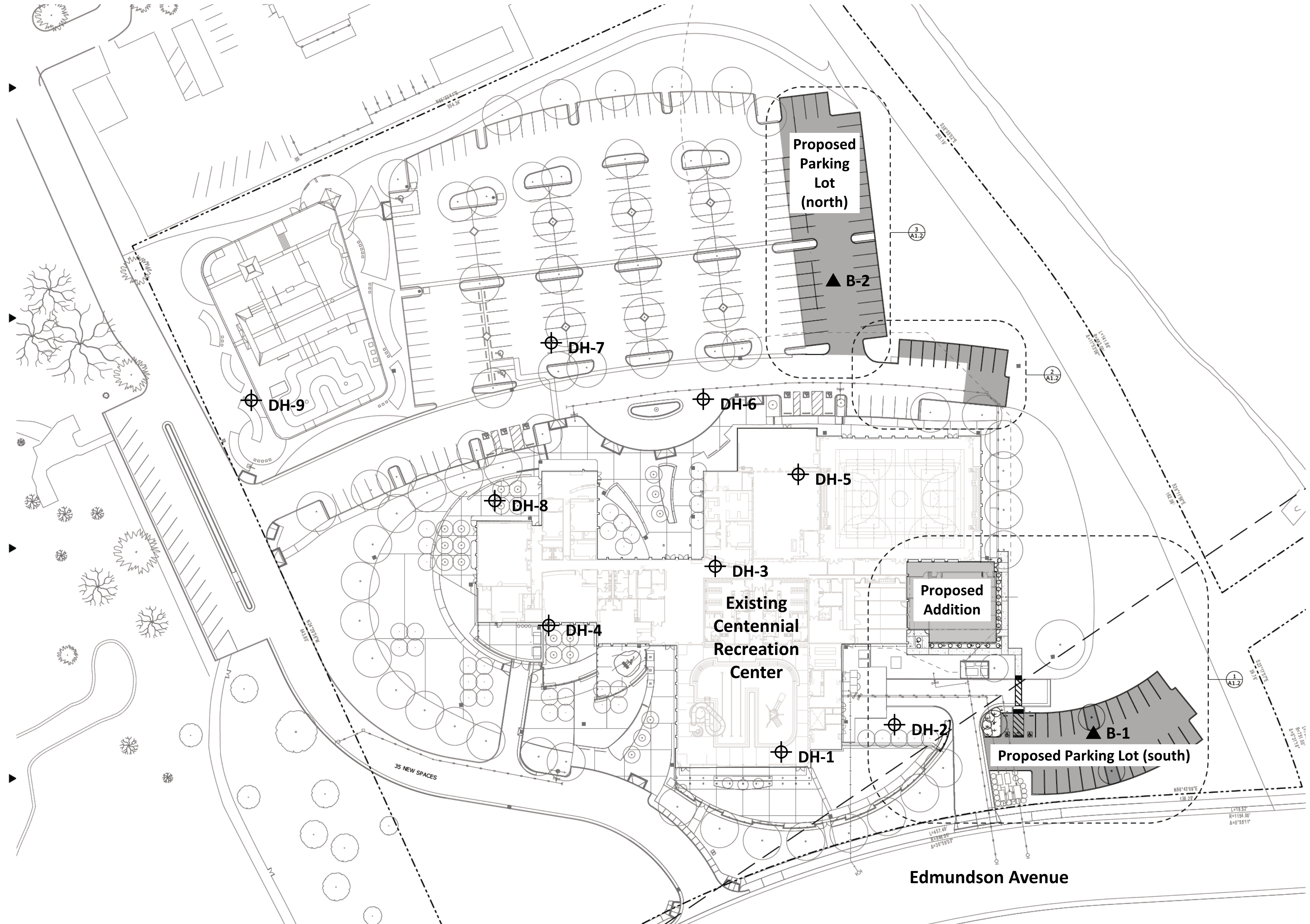
Should persons concerned with this project observe geotechnical features or conditions at the site or surrounding areas which are different from those described in this letter, those observations should be reported immediately to GLA for evaluation.

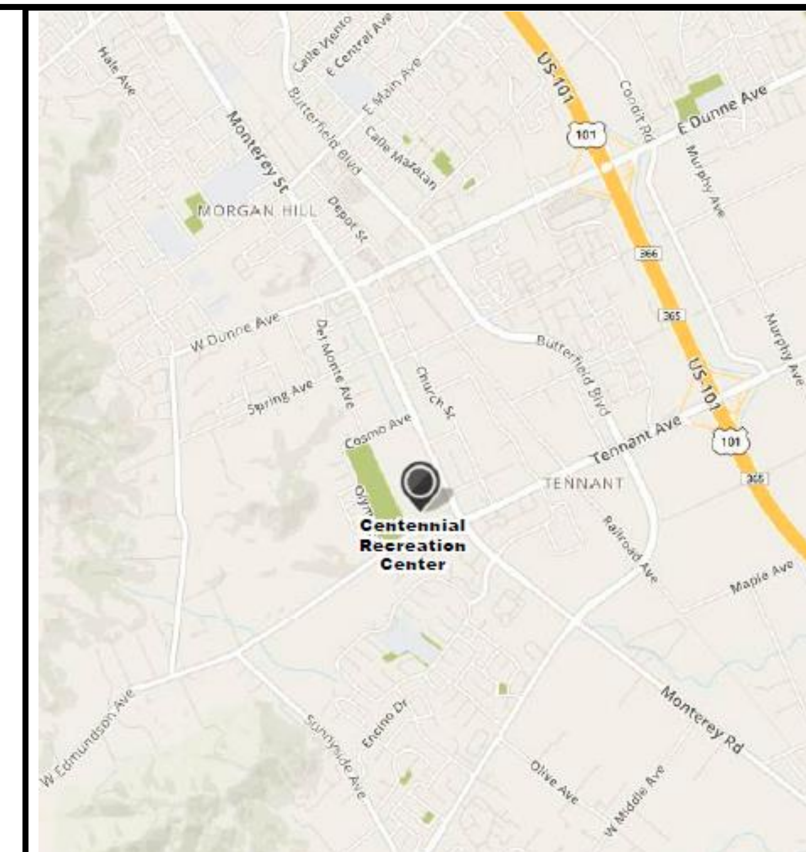
Sincerely,

Geo-Logic Associates

Chalerm (Beeson) Liang, GE 2031
Supervising Geotechnical Engineer

Attachments: Figure 1, Site Plan
Logs of DH-1, DH-6 and DH-8





Vicinity Map (No Scale)

Legend

⌖ DH-9 Number & approximate location of exploratory drill hole (November 2003 investigation)

▲B-1 Number & approximate location of surface bulk sample (this investigation)

Base

Overall Site Plan, Centennial Recreation Center Expansion Project, City of Morgan Hill, 171 W Edmundson Ave., Morgan Hill, CA 95037, prepared by Weston Miles Architects, dated 7/5/2018.

Scale (feet)

0 30 60 90 120 150

N

Geo-Logic ASSOCIATES	16055 Caputo Drive, Suite D Morgan Hill, California 95037 Phone (408) 778-2818 Fax (408) 779-6879	Drafted By: Date: Checked By: Revision:	SITE PLAN MORGAN HILL CENTENNIAL RECREATION CENTER EXPANSION 171 W Edmundson Avenue Morgan Hill, California	FIGURE 1 PROJECT PA18.1042

LOG OF EXPLORATORY DRILL HOLE

DATE: 10/2/03 | **DH -** 1

PROJECT NAME: Morgan Hill Recreational Center | **PROJECT NUMBER:** 1912E

DRILL RIG: Mobile B40 w/140lb Downhole Hammer w/Wire Winch | **LOGGED BY:** CSS

HOLE DIAMETER: 8″ Hollow Stem Auger | **HOLE ELEVATION:** --

SAMPLER:
D = **Dames & Moore (3" O.D.)**
X = **Modified California (2.5" O.D.)**
I = **Standard Penetrometer (2" O.D.)**
"S" indicates slough in sampler

GROUND WATER DEPTH: **Initial** 27′@10:15AM **Final** 24′@ 4:30PM

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE		LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM: CLAY: Dark grayish, brown (10YR 4/2), moist, hard, up to 10% fine sand	CI	1	S D D	83	>4.5	85		25	8.5	7	101		
SANDY SILTY CLAY: Yellowish brown (10YR 5/6), damp, hard, 25-40% fine sand	CL-ML	2											
		3	S D D	45	>4.5								
just below 3′ moist, brown (10YR 4/3)		4							18		110	5	20050
SANDY LEAN CLAY: Streaky dark yellowish brown (10YR 4/4), w/yellowish brown (10YR 5/8) and grayish brown (10YR 5/2), moist, hard, 30-50% fine sand w/ minor medium sand	CL	5											
		6	S D D	82	>4.5								
		7											
		8											
		9	S I I	36									
		10											
		11											
		12											
		13											
		14	S D D	51	>4.5								
		15											
		16											
		17											
FAT CLAY W/SAND: Dark yellowish brown (10YR 4/4), mottled w/ streaked yellowish brown (10YR 5/8)and grayish brown (10YR 5/2), moist, hard, 10-20% fine sand	CH	18											
		19	S D D	60	>4.0-4.5 >4.5								
		20											

PACIFIC GEOTECHNICAL ENGINEERING

DATE: 10/2/03

LOG OF EXPLORATORY DRILL HOLE

DH - 1

PROJECT NAME: Morgan Hill Recreational Center

PROJECT NUMBER: 1912E

DRILL RIG: Mobile B40 w/140lb Downhole Hammer w/Wire Winch

LOGGED BY: CSS

HOLE DIAMETER: 8” Hollow Stem Auger

HOLE ELEVATION: ---

SAMPLER:
D = **Dames & Moore (3" O.D.)**
X = **Modified California (2.5" O.D.)**
I = **Standard Penetrometer (2" O.D.)**
"S" indicates slough in sampler

GROUND WATER DEPTH: **Initial** 27’@10:15AM **Final** 24’@ 4:30PM

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE		LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
— ? — ? — ? — — — — ? — — ? — **FAT CLAY:** Dark yellowish brown (10YR 4/4) mottled and streaked w/yellowish brown (10YR 5/8) and grayish brown (10YR 5/2), moist, very stiff to hard (Pocket Pen varies from 2.5-4.5 at 1” intervals on sample); feel silty on teeth and on hands, up to 5% fine sand		21											
		22											
		23											
		24	S D	34	4.0								
		25	D S		4.0	92			23		104	10	5500
		26	I I	34	2.5 4.5								
		27											
gradational contact to		28											
CLAYEY SAND: Dark yellowish brown(10YR 4/6) with light grayish brown (10YR 6/2), moist, dense, variable fines from 30-50%, fine to medium sand	SC	29	S D	56									
		30	D			46							
		31											
coarsens w/depth		32											
CLAYEY SAND w/GRAVEL: Brown(7.5YR 4/4), moist, very dense, up to 20% fines, fine to coarse sand, 10-30% subrounded gravel up to 1” diameter	SC	33											
		34	S D	94									
		35	D			11							
		36											
		37											
		38											
		39	S I	48									
		40	I										
BOTTOM OF HOLE @ 40 FEET No Ground Water Encountered													

DATE: 10/2/03

LOG OF EXPLORATORY DRILL HOLE

DH - 6

PROJECT NAME: Morgan Hill Recreational Center

PROJECT NUMBER: 1912E

DRILL RIG: Mobile B40 w/140lb Downhole Hammer w/Wire Winch

LOGGED BY: CSS

HOLE DIAMETER: 8″ Hollow Stem Auger

HOLE ELEVATION: --

SAMPLER:
D = **Dames & Moore (3" O.D.)**
X = **Modified California (2.5" O.D.)**
I = **Standard Penetrometer (2" O.D.)**
"S" indicates slough in sampler

GROUND WATER DEPTH: **Initial** --- **Final** ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE		LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM: CLAY: Yellowish brown (10YR 5/4), dry, very stiff; up to 15% fine sand	CI	1	S D D	27	4.5 >4.5								
		2											
		3											
CLAY W/SAND: Dark yellowish brown (10YR 3/4) to yellowish brown (1-YR 5/6), damp to moist, very stiff; variable amounts of fine to medium sand up to 30%	CI	4	S D D	44									
		5											
		6											
BOTTOM OF HOLE @ 5 FEET No Groundwater Encountered		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											

PACIFIC GEOTECHNICAL ENGINEERING

DATE: 10/2/03

LOG OF EXPLORATORY DRILL HOLE

DH - 7

PROJECT NAME: Morgan Hill Recreational Center

PROJECT NUMBER: 1912E

DRILL RIG: Mobile B40 w/140lb Downhole Hammer w/Wire Winch

LOGGED BY: CSS

HOLE DIAMETER: 8” Hollow Stem Auger

HOLE ELEVATION: --

SAMPLER:
D = **Dames & Moore (3" O.D.)**
X = **Modified California (2.5" O.D.)**
I = **Standard Penetrometer (2" O.D.)**
"S" indicates slough in sampler

GROUND WATER DEPTH: **Initial** --- **Final** ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE		LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM: CLAY: Yellowish brown (10YR 5/4), dry, very stiff; up to 10% fine sand	CI												
		1	S										
			D	31	4.25								
		2	D						6.8		90		
					4.25								
		3	S										
			D	31									
CLAY W/SAND: Dark yellowish brown (10YR 3/4) to yellowish brown (1-YR 5/6), damp to moist, very stiff; up to 20% fine sand	CI	4	D		>4.5								
		5											
			S										
CLAYEY SAND: Dark yellowish brown (10YR 3/6), moist, dense; fine to medium sand w/trace coarse sand, up to 40% fines	SC	6	D	744					13		106		
			D										
		7											
BOTTOM OF HOLE @ 6.5 FEET No Groundwater Encountered		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											

PACIFIC GEOTECHNICAL ENGINEERING

DATE: 10/2/03

LOG OF EXPLORATORY DRILL HOLE

DH - 8

PROJECT NAME: Morgan Hill Recreational Center **PROJECT NUMBER:** 1912E

DRILL RIG: Mobile B40 w/140lb Downhole Hammer w/Wire Winch **LOGGED BY:** CSS

HOLE DIAMETER: 8″ Hollow Stem Auger **HOLE ELEVATION:** --

SAMPLER: D = **Dames & Moore (3" O.D.)**
X = **Modified California (2.5" O.D.)**
I = **Standard Penetrometer (2" O.D.)**
"S" indicates slough in sampler

GROUND WATER DEPTH: **Initial** --- **Final** ---

DESCRIPTION OF EARTH MATERIALS	SOIL TYPE	DEPTH (ft)	SAMPLE	BLOWS PER FOOT	POCKET PEN (tsf)	% PASSING #200 SIEVE		LIQUID LIMIT	WATER CONTENT	PLASTICITY INDEX	DRY DENSITY (pcf)	FAILURE STRAIN (%)	UNCONFINED COMPRESSIVE STRENGTH (psf)
ALLUVIUM: CLAY: Yellowish brown (10YR 5/4), dry, very stiff; up to 10% fine sand	CI	1	S D D	23	>4.5				19		99		
CLAY W/SAND: Dark yellowish brown (10YR 3/4) to yellowish brown (1-YR 5/6), damp to moist, hard; 10-20% fine sand	CI	2											
		3											
		4	S D D	48	>4.5				16		104		
		5											
BOTTOM OF HOLE @ 5 FEET No Groundwater Encountered		6											
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											