GEOTECHNIQUES
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June 30, 2017
Project No. 1003.035

Ventura County Community College District
c/o Moorpark College
Department of Maintenance and Operations
7075 Campus Drive
Moorpark, California 93021
Attention: Mr. John Sinutko

Subject: Geotechnical Update, Gymnasium Swing Space, Moorpark College, Moorpark, California

Dear Mr. Sinutko:

This geotechnical letter report summarizes site conditions and provides recommendations for the proposed swing space to be used during renovations to the gymnasium at Moorpark College.

PROPOSED PROJECT

The swing space will consist of construction of a modular building on a pad at or within about 1 foot of existing grade and a separate weight room with an on-grade concrete floor slab located about 100 feet west. Associated improvements consist of a storm water retention (not infiltration) basin, on-grade concrete sidewalks and hardscape, rerouting of existing and installation of new underground utility lines and service laterals, a light standard, and a javelin throw event area.

SITE CONDITIONS

The swing space site is located in an area of existing modular buildings along the north side of the Maintenance and Operations (M&O") service road. The proposed weight room will be located immediately north of a "Maintenance" building at the westerly end of the row of modular buildings north of the athletic field, and the proposed swing space building will be located at the easterly end of this row. Plate 1 – Site Plan, shows the proposed swing space improvements relative to existing buildings and improvements.

Past Grading

The swing space and weight room site is underlain by engineered fill placed in the mid-1960s during original campus grading and development. Between about 6 and 8 feet of compacted fill was placed in the swing space area and between about 2 and 3 feet of fill was placed in the weight room area during site grading between September 1965 and June 1966[1].

Subsurface Conditions from Past Grading

Earth materials placed as fill during original site grading consisted of clayey sand (SC) to silty sand (SM)[1]. Compaction test data for the fill in the swing space area show percent relative compaction between the upper eighty and upper ninety percent of the maximum dry density determined according to ASTM D1557 using a three-layer curve. The maximum dry densities used

[1] LeRoy Crandall and Associates (1966), "Control of Compacted Fill, Proposed Moorpark College, Portions of Sections 35 and 36, T3N, and R19W, Ventura County, California," LCA Job No. B-65216, dated September 21

to determine the relative compaction of the fill at that time, 1965-1966, was based on generating three-layer samples, which yields lower maximum densities than five layer samples; hence, when compared with maximum dry densities determined under current standards (ASTM D1557-12), the relative compaction would be a few percentage points lower than those reported in the original compaction report[1]. According to the data presented in the original compaction report, this correction would result in relative compaction between about 85 and 95 percent by current standards.

Underlying Native Soil Conditions

Borings excavated in the vicinity of the parking structure[2] and athletic field[3], and the approximately 10-foot deep excavation for the storm water retention basin for the parking structure, located about 300 feet east of the subject site, encountered predominantly native clayey sand and silty sand below the artificial fill.

Groundwater

Groundwater was not encountered to the maximum exploration depth of about elevation 592 feet at the nearby parking structure site located east of the proposed swing space[2]. Additionally, groundwater was not encountered to a depth of about 21 feet (El. 612 feet) in the deepest boring excavated at the athletic field located south of the swing space[3].

SEISMICALLY INDUCED SETTLEMENT

Liquefaction

The absence of groundwater to an elevation of about 592 feet, equivalent to about 42 feet below the swing space building area elevation would preclude the potential for liquefaction-induced settlement to that depth.

Seismically-Induced Settlement of Dry Sands

Seismically-induced settlement in compacted fill materials beneath the subject site is anticipated to be negligible.

Seismically induced settlement of native dry sands was estimated at up to about ½ inch at the parking structure site[2]. Differential seismically-induced settlement was estimated at about one-half the total settlement over a distance of about 30 feet.

STORM WATER RETENTION BASIN

Storm water retention areas are proposed along the northeast and/or southeast sides of the modular building pad. The modular building area and vicinity is underlain by between roughly 6 and 8 feet of artificial fill placed during original site grading completed in 1966, with fill thickness increasing to about 9 feet to the southeast perimeter of the pad area. Infiltration should not be allowed in artificial fill and adjacent to and up-gradient of building foundations, and because of those restrictions and underground utility conflicts is not contemplated near or adjacent to the building pad for this project. Retention areas should be lined with an impermeable membrane and incorporate

[2] Geotechniques (2011), "Geotechnical Study, Parking Structure, Moorpark College," Project No. 1003.026), dated February 25.
[3] Fugro West, Inc. (2004), "Geotechnical Study, Athletic Field/Track Renovation, Moorpark College, Moorpark, California," FWI Project No. 3123.011, dated February 3.

an underdrain for collection of treated storm water. Impermeable retention areas should be set back at least 8 feet from building foundations.

Alternatively, infiltration basins sited at least 20 feet down-gradient from the building pad should be on the order of 10 feet deep in order to be bottomed into native undisturbed clayey sand. Earthwork operations should not disturb or compact the infiltration basin excavation bottom. Earthmoving and compacting equipment other than manually-operated should not be allowed to traffic on or within 2 feet above the excavation bottom to protect the bottom from incidental compaction and disturbance. An infiltration rate for native clayey sand exposed in the bottom of the parking structure infiltration basin, located about 300 feet east of the proposed modular building, was measured at about 1 inch per hour. The infiltration rate should be verified upon basin excavation.

SITE SUBGRADE PREPARATION RECOMMENDATIONS

Recommendations for subgrade preparation are intended to mitigate loose or soft soil conditions anticipated in the upper 1 foot of soils below the surficial grass mat in improvement areas and to prepare the surface in areas to receive fill to achieve proposed grades.

The grass mat, including the root mass, should be stripped from improvement areas prior to excavating, including along trench excavations for utilities. The grass mat should be hauled offsite and wasted.

Shallow Footings for Swing Space Modular Building and Weight Room

Foundations for the Swing Space Modular building and the Weight Room should be bottomed a minimum of 18 inches below lowest adjacent grade into previously compacted fill materials. Footing excavations should be observed by the Geotechnical representative. Loose or soft soils may warrant localized deepening of the footing excavation or recompaction of those exposed fill materials.

Weight Room Slab-on-Grade

The subgrade for the proposed weight room to a distance of at least 1 foot beyond the slab perimeter should be overexcavated to a depth of 1 foot and compacted to a minimum of 92 percent of the maximum dry density determined by ASTM D1557. The exposed surface should be observed by the Geotechnical representative prior to placement of fill.

Exterior On-Grade Concrete

The upper 1 foot of subgrade for on-grade concrete for sidewalks, drainage devices, and stairs should be moisture-conditioned, processed, and compacted to a minimum of 92 percent of the maximum dry density in accordance with the "Fill Placement and Compaction" section presented subsequently.

Fill Placement and Compaction

Onsite soils are anticipated to be used as general fill once cleared of organic material, demolition or other debris, and oversized rock. The grass mat should be stripped and removed from all excavation and stockpile areas. Fill materials placed in the upper 1 foot of subgrade beneath interior floor slabs should consist of non-expansive granular "select fill" materials with an Expansion

Index less than 20. Fill materials should be compacted to a minimum of 92 percent of the maximum dry density determined from ASTM D1557.

Fill placement and earthwork operations should be performed according to the recommendations of this report. We recommend that, unless otherwise noted, all fill materials be compacted to at least 92 percent relative compaction, based on the maximum dry density determined from ASTM D1557.

Onsite soils used as fill and imported fill materials should be placed and compacted at a moisture content of between 0 and +3 percent of optimum moisture content. Each layer should be spread evenly in loose lifts no thicker than 8 inches and should be thoroughly blade-mixed during the spreading to provide relative uniformity of material within each layer. Fill and backfill materials may need to be placed in thinner lifts to achieve the recommended compaction with the equipment being used. Soft or yielding materials should be removed and be replaced with properly compacted fill material, prior to placing the next layer.

Rock, gravel and other oversized material greater than 4 inches in diameter, should be removed from the fill material being placed. Rock less than 4 inches in diameter should not be nested and voids caused by inclusion of rock in the fill should be filled with sand or other approved material. All roots larger than ½-inch diameter should be removed and discarded.

All fill materials, including scarified materials, should be thoroughly processed to pea-sized or finer consistency or finer prior to applying compactive effort. When the moisture content of the fill material is below that sufficient to achieve the recommended compaction, water should be added to the fill during processing. While water is being added, the soil should be bladed and mixed to provide relatively uniform moisture content throughout the material. When the moisture content of the fill material is excessive, the fill material should be aerated by blading or other methods

Fill Materials

Fill should be free of organics, oversize material (e.g., greater than 4 inches in diameter), trash and debris, and other deleterious material. The expansion index of imported materials or clayey onsite materials used as general fill should be tested, as necessary, during earthmoving operations to verify that the expansion index of the material is suitable for its use as general or select fill.

Onsite Soils. Based on the compaction test data for previously-placed fill, onsite soils are generally anticipated to consist of clayey to silty sand that meet the requirements for general or select fill. Sandy materials that meet the requirements for select fill should be used as fill beneath the weight room floor slabs-on-grade. Sandy materials should be selectively separated from clayey excavated materials and stockpiled for use as select fill.

General Fill. General fill materials should have an expansion index less than or equal to 40. General fill may be used as backfill in foundation overexcavation areas, except within the upper 1 foot of subgrade beneath interior floor slabs, where select backfill should be used.

There is a potential that clayey onsite general fill materials could be sensitive to changes in moisture content. Control of moisture content and compaction layer thickness will likely be necessary to achieve the recommended compaction.

Select Fill. Select fill materials should have an expansion index less than or equal to 20. Select fill should be used as fill within the upper foot of subgrade beneath the weight room floor slab-on-grade.

Imported Fill. Imported fill to be used as general or select fill should meet the requirements of general or select fill material and should be observed and tested by Geotechniques prior to being brought to the site.

Bedding Sand in Utility Trench and Beneath Floor Slab and On-Grade Concrete. Sand placed beneath the weight room slab-on-grade, beneath on-grade concrete, and used as bedding and pipe zone sand in utility trenches should conform to Caltrans Standard Specifications for sand bedding, Section 19-3.02E(2) (2010. The sand should have a gradation that allows the material to maintain a compacted surface condition during construction operations until concrete placement or until pipe and/or subsequent lift placement (i.e., as bedding or pipe zone sand in utility trench).

UTILITY TRENCHES

Utility trenches should be braced or sloped in accordance with the requirements of (Cal) OSHA. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction recommendations.

The grass mat along trench excavations should be stripped and hauled offsite prior to excavating. Trench backfill should be moisture conditioned between 0 and 3 percent over optimum moisture content prior to placing in trench. Backfill should be compacted to a minimum of 92 percent relative compaction as determined from ASTM D1557.

Rock larger than 4 inches in maximum dimension should be excluded from backfill. Jetting of trench backfill materials should not be permitted.

Trench backfill materials should consist of bedding and pipe zone sand placed 4 inches below the pipe invert and to a height of 12 inches above the top of the pipe. Bedding and pipe zone sand should consist of fine to medium or coarse sand with a minimum sand equivalent (SE) of 30. General or select fill or pipe zone sand should be placed as backfill above the pipe zone in 8-inch loose lifts and compacted to the minimum relative compaction summarized above. General backfill materials should meet the preceding recommendations of this report, “Fill Placement and Compaction” and “Fill Materials.”

ASCE 7-10 / 2016 CALIFORNIA BUILDING CODE SEISMIC DESIGN PARAMETERS

Seismic design parameters for the swing space and weight room were generated using site coordinates 34.2989° N, -118.8372° W, and in accordance with 2016 CBC and ASCE 7-10. Soil conditions in the upper 100 feet are based on the generalized conditions summarized above and, in accordance with Table 20.3-1 in Chapter 20 of ASCE 7-10 and Section 16.3.2 of the 2016 CBC, are anticipated to be consistent with Site Class “D.”

The following seismic parameters are recommended for design for Risk Category I/II/III and consistent with the 2016 CBC and ASCE 7-10 for Site Class “D” soil profile:

Seismic Parameter	Value	CBC Source	ASCE 7-10 Source
Mapped Spectral Response Acceleration			
S_s	2.607	Figure 1613.3.1 (1)	Figure 22-1
S_1	0.904	Figure 1613.3.1 (2)	Figure 22-2
S_{MS}	2.607g	Equation 16-37	Equation 11.4-1
S_{M1}	1.355	Equation 16-38	Equation 11.4-2
Design Spectral Response Acceleration			
S_{DS}	1.738	Equation 16-39	Equation 11.4-3
S_{D1}	0.904	Equation 16-40	Equation 11.4-4
PGA_M	1.077		Figure 22-7

FOUNDATION DESIGN PARAMETERS AND RECOMMENDATIONS

Footings

The following recommendations for footing design are predicated on subgrade preparation in accordance with the recommendations presented in this report.

Footing Depth. Footings should be bottomed a minimum of 18 inches below lowest adjacent grade and should be bottomed into previously compacted artificial fill.

Allowable Bearing Pressure. Footings bearing on compacted fill placed during original grading may be designed for maximum allowable bearing pressure of 2,000 pounds per square foot (psf). The recommended allowable bearing pressure provides a factor of safety against shear failure in excess of 3. A one-third increase in the allowable bearing pressure may be used for transient loads such as seismic or wind forces.

Estimated Settlement. On the basis of the foregoing, we estimate that post-construction settlement from structural loads should be less than 1 inch. For design purposes, foundations should be designed to accommodate differential settlement of about ½ inch over a distance of 30 feet, or a distortion ratio of about 1/720. Further, for design purposes, an estimated ¼ inch of seismically induced settlement of dry sands over a distance of 30 feet should be added to the static differential settlement from structural loads.

Slabs-on-Grade

The floor slab-on-grade for the open-air weight room (i.e., no exterior walls) and exterior on-grade concrete in non-traffic areas should, at a minimum, be underlain by 4 inches of sand conforming to Caltrans Standard Specifications for sand bedding, Section 19-3.02E(2) (2010). The sand should be lightly moistened and compacted with about three passes of a vibratory roller or vibraplate until dense and "set," and should maintain compacted surface condition during construction operations until concrete placement.

Sliding and Passive Resistance

Ultimate sliding resistance generated through a sand/concrete interface may be estimated by multiplying the total dead weight structural loads by a coefficient of 0.4. Ultimate passive resistance developed from lateral bearing of footings bearing against compacted backfill below a depth of 1 foot below the lowest adjacent grade may be estimated using an equivalent fluid weight of 250 pounds per cubic foot (pcf). Sliding and passive resistance may be combined without reduction, when used with the safety factors of 1.5 for overturning and 2.0 for sliding. The safety factor for sliding can be reduced to 1.5 is passive resistance is neglected. The factor of safety for transient conditions should be at least 1.1.

Light Standard Foundations

An allowable passive resistance of 250 pounds per square foot (psf) per foot of depth may be used when designing drilled pier foundations for light standards in accordance with CBC Section 1807A.3.2. The minimum drilled shaft diameter should be 24 inches to allow for excavation and clean-out of the final 1 foot of shaft bottom with a clean-out bucket just before and during the completion of drilling. The drilled shaft should be observed by the geotechnical representative during excavating.

CLOSURE

The recommendations in this letter are specific to the scope of the proposed gymnasium swing space presented herein. Additionally, data and recommendations by Geotechniques[2] and not specifically addressed should be considered applicable to the swing space site and should be considered to constitute the baseline geotechnical study for this project.

We appreciate the opportunity to be of service to Moorpark College and the Ventura County Community College District. Please call if you have any questions concerning this letter.

Sincerely,

Geotechniques

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Attachments: Plate 1

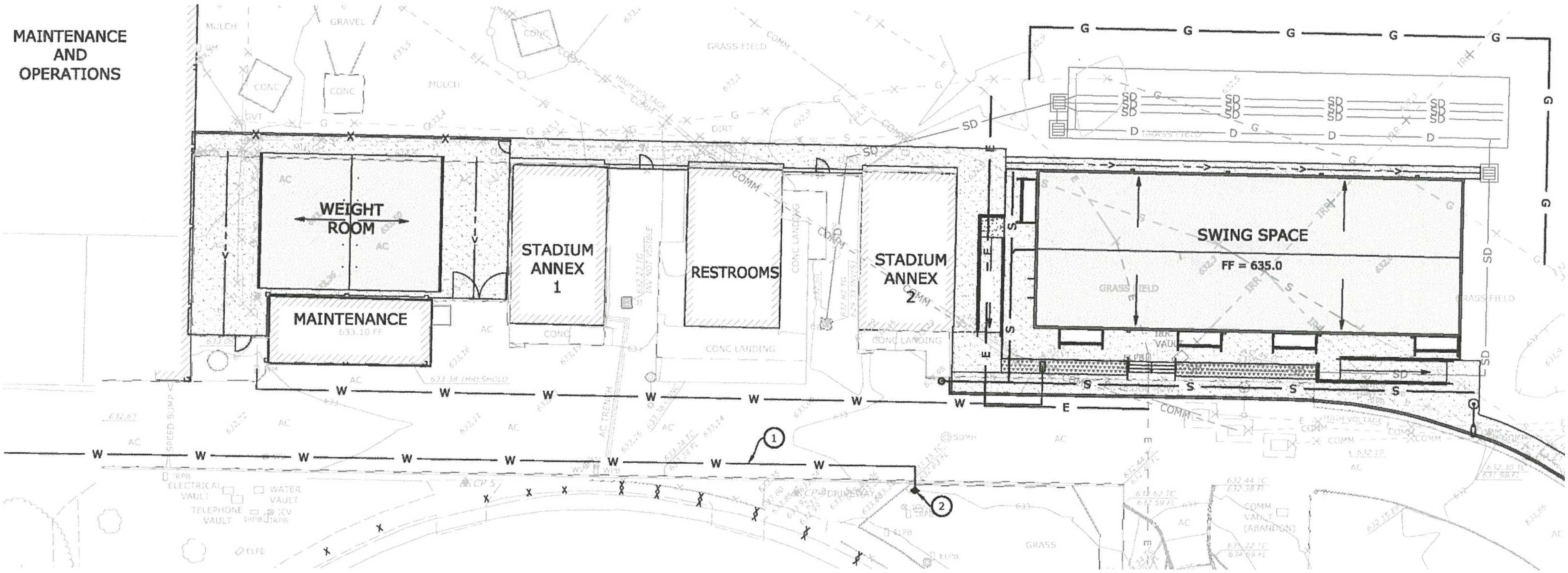

PLATE 1
SITE PLAN
MOORPARK COLLEGE GYMNASIUM SWING SPACE