Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

September 11, 2017

Project No. 11672.001

Mount San Antonio College
Facilities Building 46
1110 North Grand Avenue
Walnut, California 91789

Attention: Mr. Gary Gidcumb, Architect, LEED AP

Subject: **Geotechnical Review**
Mount San Antonio College South Campus-West Parcel
West of Grand Avenue and Approximately 500 Feet Southeast of Temple Avenue/Amar Road
City of Walnut, California

INTRODUCTION

Leighton Consulting, Inc. (Leighton) presents this geotechnical review of the preliminary review by the United Walnut Taxpayers (UWT, 2017) of the Converse Consultant's (Converse) Geotechnical Study Report (Converse, 2014); and Converse's "West Parcel – Landslide Toe Test Pit Trench Study, Mt. San Antonio College West Parcel Solar Project, 1100 North Grand Avenue, Walnut, California 91789, Converse Project No. 13-31-339-30", dated July 27, 2017. The Converse reports (2014 and 2017) were prepared for the proposed rough grading in the West Parcel of the South Campus of Mount San Antonio College in the City of Walnut, California. The site of the proposed development is located west of Grand Avenue approximately 500 feet southeast of Temple Avenue/Amar Road.

Converse conducted a subsurface investigation of the site for their 2014 Geotechnical Study Report and presented their findings, conclusions, and geotechnical recommendations as they relate to the rough grading design depicted in the preliminary site plan titled "Grand Avenue Parcel Earthwork, Exhibit D-5," dated November 4, 2013,

and a revised drawing annotated by Newcomb/Anderson/McCormick, dated January 7, 2014. We have been provided undated "South Campus Site Improvements – West" plans produced by Psomas, which include the proposed rough grading design. It is our understanding that the grading plan by Psomas is similar to the plan referenced in Converse's report and the plan referenced during UWT's review of Converse's report.

The United Walnut Taxpayers (UWT) reviewed Converse's 2014 Geotechnical Study Report and presented their preliminary review comments in a letter dated May 8, 2017. A summary of their review comments are presented below.

We performed a limited independent geotechnical and geologic study of the site relative to the design presented in Psomas' plan. We excavated one hollow stem boring in the canyon located in the northern portion of the site. Our subsurface exploration was planned to also include several large-diameter borings and test pit onsite, however, our site exploration was terminated before the large-diameter borings and test pits were excavated.

Converse excavated four exploratory test pits at the toe of an existing landslide (Test Pit Nos. 1 through 4), adjacent to Grand Avenue, in the West Parcel of the proposed South Campus solar project. Converse's purpose for the four test pits was to determine the depth and the lower extents of the existing landslide, and to observe the structure of the underlying intact bedrock. Leighton observed the conditions exposed in three of Converse's four test pits (Test Pit Nos. 2, 3, and 4).

Our geotechnical review of UTW's comments and Converse's 2017 Test Pit Trench Study was based on our limited subsurface data and findings from Converse's 2014 and 2017 reports. Our findings and conclusions presented below address some of the issues presented in the preliminary review by UWT. Considering this, our responses to the UWT review presented below are preliminary, and may change based on future geotechnical exploration or plan reviews.

LIMITED INDEPENDENT GEOTECHNICAL EXPLORATION BY LEIGHTON

1) Scope and Purpose

We were initially retained by Mount San Antonio College to conduct an independent geotechnical study considering the rough grading plan depicted in the referenced undated improvements plan by Psomas. However, our subsurface exploration was terminated before we excavated our proposed large-diameter borings and test pits.

Based on the tasks we were able to perform, our limited geotechnical exploration included:

- We reviewed of pertinent reports, maps, and aerial photographs including the 1974 Geologic-Seismic Study for the General Plan, City of Walnut (County of Los Angeles, 1974) as well as a subsurface investigation.

- We drilled, sampled, and logged one hollow-stem auger boring (LB-1) in the northern canyon onsite in a location near Grand Avenue, where the thickest amount of surficial soils in the entirety of the project site was anticipated. This hollow-stem auger boring was sampled and logged by a staff geologist under the field supervision of a Professional Geologist.

The initial purpose of our study was to investigate the site geologic and geotechnical conditions with respect to the proposed rough grading plan and provide preliminary geotechnical recommendations for the proposed improvements. Because we weren't able to complete our subsurface exploration, our limited study could not completely address the analysis of landslide and mass movements, analysis of the stability of proposed slopes including the design slope adjacent to the existing residences on Regal Canyon Drive, clarifying remedial removals and measures to mitigate landslide mass movements, and other geotechnical issues. Our hollow-stem-auger boring (LB-1) allowed us to evaluate liquefaction. The log for boring LB-1 is attached.

The scope of our limited subsurface exploration addresses some, but not all of the issues presented in UTW's review of Converse's 2014 study. Future geotechnical investigations should include observations of the geologic conditions of the site by a Professional Geologist and/or Certified Engineering Geologist. Future geotechnical investigations should also address all significant geotechnical issues relating to the design and construction of the site in order to adequately support the County of Los Angeles Building Code Section 111 statement.

2) <u>Preliminary Findings</u>

Plate II of the Geologic-Seismic Study for the General Plan for the City of Walnut (County of Los Angeles, 1974) indicates that portions of the site range from having low to high landslide potential. We conducted an aerial photograph review of the site and observed geomorphic expressions of a landslide in the central hill in photographs ranging in date from 1980 through 2016. We also observed the conditions of that landslide during a field reconnaissance. Converse Consultants excavated four test pits

at the toe of this landslide on June 9 and 12, 2017. We observed three (of four) of their test pits, which exposed landslide debris overlaying intact claystone, siltstone, and sandstone bedrock. Based on the observations made during Converse's test pits, the landslide debris appears to terminate downslope at the geomorphological toe of the landslide, and does not cross Grand Avenue. Future geotechnical studies of the site should include exploration through the middle portion of the landslide extending into the underlying bedrock. The observations made in these borings would indicate an estimate of the depth and the nature of the failure and provide data regarding the geologic conditions beneath the landslide. Understanding these elements would also indicate removal recommendations for the landslide debris and slope stability analysis of the proposed grading design in the area of the landslide.

We have also reviewed three published geologic maps that cover the project site (County of Los Angeles, 1974, Dibblee, 2002, and Shelton, 1965). All three maps indicated that bedding within and around the site dips towards the northeast, east-northeast, and north-northeast at angles ranging from approximately 20 to 30 degrees. Additionally, the test pits conducted by Converse at the toe of the landslide in the central hill exposed intact bedrock with bedding planes dipping towards the north and east-northeast at angles ranging from 12 to 32 degrees. Future geotechnical studies of the site should include work to develop a better understanding of the geologic structure onsite.

We logged and sampled a hollow-stem auger boring, LB-1, located in the northern canyon near Grand Avenue. In LB-1, we found approximately 40 feet of alluvium consisting of clayey and and silty sand with gravel, gravel with sand, and sand with gravel overlaying siltsone interbedded with sandstone. Groundwater in LB-1 was encountered at a depth of approximately 37 feet below the existing ground surface.

3) Slope Stability Analysis

Our current understanding of the geologic structure onsite suggests that bedding potentially dips north and northeast. This is an out-of-slope condition for the approximately 35-foot-tall, 2:1 gradient (horizontal:vertical) design cut slope beneath the existing residences along Regal Canyon Drive in the northwestern portion of the project site. Considering this, we have prepared a preliminary cross section representing that slope, but with what we believe are conservative assumptions (the design slope is a 60-foot-tall, 2:1 gradient cut constructed in predominantly interbedded claystone, sandstone, and siltstone dipping directly out-of-slope at an angles of 10 to 16 degrees). We assumed what we believe are representative to conservative along-bedding

strength parameters for the bedrock - a cohesion of 250 psf and an angle of internal friction of 10 degrees. Our preliminary slope stability analysis yielded a factor of safety of less than 1.5 with these parameters. To provide adequate stability for the analyzed slope, our preliminarhy analysis indicates that an approximately 40-foot-wide stability buttress founded in a 5-foot deep key would need to be constructed for the slope. This preliminary analysis was conducted only to check whether stabilization of the slope is feasible.

The conditions of all design slopes and any natural slopes with potential instability should be further evaluated in future geotechnical studies of the site. Slope stability analysis should be conducted for cut, fill, and natural slopes in order to adequately support the County of Los Angeles Building Code Section 111 statement.

The spatial extents and depths of the existing landslide should be modelled in future geotechnical studies of the site to evaluate the temporary stability of the excavation once landslide debris removal have been completed.

4) Liquefaction Analysis

The State of California has mapped a portion of this site to be in an area of liquefaction potential. Converse has analyzed the potential for liquefaction based on their boring BH-15. This boring was located in the southern canyon onsite, and was observed to have drilled through approximately 12 feet of alluvium with perched groundwater in the bedrock 16 feet below the surface. The northern canyon onsite was observed by Converse to contain alluvium greater than 21.5 feet deep, with groundwater 15.5 to 21.25 feet below the surface. These borings did not extend to bedrock, and Converse did not use data from the deeper northern canyon while performing liquefaction analysis.

Alluvium extended to a depth of approximately 40 feet below the existing ground surface in our boring LB-1, located in the middle of the northern canyon near Grand Avenue. The alluvium encountered consisted of clayey sand, silty sand with gravel, and gravel with sand, and was very dense at a depth of approximately 20 feet below the surface. Groundwater in our boring was encountered at a depth of approximately 37 feet below the ground surface.

We conducted liquefaction analysis based on the subsurface data from our boring LB-1 and considered the observations made by Converse in their borings BH-1, BH-2, and BH-7, which were all located in the northern canyon. We assumed alluvium to be 40

feet thick based on conditions observed in LB-1, and we assumed a highest historical groundwater of 16 below the ground surface based on the highest groundwater encountered in the site (Converse boring BH-2). The seismic parameters used for our liquefaction analysis were based on the results of the U.S. Geological Survey's U.S. Seismic Design Maps and Unified Hazard Tool online applications. For our liquefaction analysis, we used an adjusted Peak Horizontal Acceleration (PGA_M) of 0.77g and an earthquake magnitude of M_w=6.7.

Based on the assumptions described above, the conditions at boring LB-1 are considered non-liquefiable due to the dense soil below the assumed highest groundwater level.

We also have performed preliminary analyses to estimate the potential for seismically induced settlement using the method of Tokimatsu and Seed (1987), and based on Martin and Lew (1999), considering the maximum considered earthquake (MCE) peak ground acceleration (PGA_M). The preliminary results of our analyses suggest that the onsite soils are susceptible to approximately 0.9 inch of seismic settlement based in the MCE. These conditions are preliminarily considered suitable for the development.

5) Remedial Removals

Based on the conditions encountered in our boring LB-1, remedial removals extending to depths approaching 20 feet below the existing ground surface in the northern canyon should be recommended. Recommended depths of removals of the existing landslide in the central hill will be provided once a subsurface exploration through the landslide and subsequent analysis has been completed. Remedial removal recommendations considering differential settlement as well as collapse potential and the stability of existing slopes should be addressed in future geotechnical studies of the site. A geologic/ geotechnical map that includes approximate depths of remedial removals onsite should be included in future geotechnical studies of the site.

GEOTECHNICAL ISSUES PRESENTED IN THE UWT REVIEW OF CONVERSE'S 2014 STUDY

The UWT preliminary review of Converse's Geotechnical Study Report addresses several geotechnical or geologic issues related to the proposed rough grading. In general, the review identified the following issues:

- Lack of geologic and geotechnical data presented in Converse's report.
- Geologic conditions onsite were not observed by a Professional Geologist and/or Engineering Geologist for Converse's investigation.
- A landslide in the central portion of the site was not addressed in Converse's report.
- No slope stability analysis was included in Converse's report.
- Liquefaction analysis in Converse's report did not represent the most critical area of the site.
- The impact of the load of design fills was not addressed in Converse's report.
- Specific remedial removal recommendations were not presented in Converse's report

This letter addresses some of the issues identified in the UWT review as well as other significant geotechnical issues relating to the development of the South Campus-West Parcel site. We have attached an annotated copy of the UWT review indicating in which sections of the summary of our limited geotechnical exploration each UWT comment is addressed.

REVIEW OF CONVERSE'S 2014 WEST PARCEL -LANDSLIDE TOE TEST PIT TRENCH STUDY

Findings

Converse observed the basal plane of the landslide along the toe at elevations roughly similar to the elevations of Grand Avenue. Leighton also observed the basal plane of the landslide roughly at a similar elevation as Grand Avenue in Test Pit Nos. 2, 3, and 4. Above the landslide basal plane, landslide debris was observed to be loose, disturbed, and broken earth materials. Intact bedrock beneath the landslide basal plane consisted of siltstone, claystone, and sandstone dipping 14 to 30 degrees towards the northwest, north, and northeast.

Preliminary Conclusions

Converse concluded that the toe of the existing landslide is situated onsite just west of Grand Avenue. Based on our review of their findings and our limited observations onsite, the location of the toe of the landslide as described in Converse's Landslide Toe Test Pit Trench Study is reasonable.

Converse recommended that the existing landslide debris and slip plane should be completely removed during remedial grading of the project. Additionally, Converse recommended to construct the slope designed in the area of the existing landslide for the proposed solar project with a 25 to 40-foot-wide buttress founded 5 feet below the ground surface. Neither Converse's 2014 Geotechnical Study nor their 2017 Landslide Toe Test Pit Trench Study included slope stability analysis.

Preliminary Recommendations

Without slope stability analysis, Converse's recommendation for the construction of the design slope in the area of the existing landslide with a 25 to 40-foot-wide buttress founded 5 feet below the ground surface cannot be evaluated. Slope stability analysis should be conducted for cut, fill, and natural slopes in order to adequately support the County of Los Angeles Building Code Section 111 statement.

The spatial extents and depths of the existing landslide should be modelled to evaluate the temporary stability of the excavation of landslide debris removal. According to Los Angeles County specifications, the minimum factor of safety for temporary excavations is 1.25.

CLOSING

Our geotechnical review is based on limited data from our boring, limited observation of the surface of the site, the 2014 and 2017 reports by Converse, and our limited observations made during a portion of the fieldwork conducted by Converse for their Landslide Toe Test Pit Trench Study. Our findings, conclusions, and recommendations are preliminary in nature, and may change based on future geotechnical exploration or plan reviews.

We appreciate the opportunity to be of services to you. Should you have any questions, please do not hesitate to contact either of the undersigned.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

Jason D. Hertzberg, GE 2711
Priicipal Engineer

SGO/JDH/rsm

Attachments: References
Annotated UWT Preliminary Review
Leighton Boring LB-1 Log
Converse Borings BH-1, BH-2, and BH-7 Logs

Distribution: (1) Addressee

Leighton

REFERENCES

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