

**UNITED WALNUT TAXPAYERS PRELIMINARY REVIEW OF NEGATIVE GEOTECHNICAL AND GEOLOGICAL ASPECTS OF CONSTRUCTING EARTHFILL PAD FOR A SOLAR FARM ON THE WEST PARCEL - DRAFT**

**1. Introduction**

A licensed Engineering Geologist has been retained by United Walnut Taxpayers (UWT) to review of the report from Converse Consultants, dated December 19, 2014, from a geotechnical perspective, and grading plans prepared by Psomas and submitted to the City of Walnut on January 24, 2017. The purpose of this work was to assess the general geological setting of the site, assess the hazards and issues related to placement of earthfill at the site in accordance with grading plans received, and determine if it is possible to develop a project in a safe manner suitable to support the proposed earthfill development and maintain the integrity of the surrounding properties. Licensed Civil Engineers from United Walnut Taxpayers are overseeing this work and have prepared this draft summary document.

**2. Initial Summary of Preliminary Expert Opinion of Converse and Psomas Reports**

**a. Significant Deficiencies in Converse Subsurface Investigations, Analysis and Baseline Geologic Data**

- i. Conclusions are not well supported and there is no discussion and/or analysis of significant issues.
- ii. Poorly supported conclusions could impact the stability and safety of the project site and the safety of adjacent offsite properties and homes.
- iii. Subsurface investigations did not provide for direct observation of geologic field conditions by a Professional Geologist and/or Engineering Geologist.
- iv. Complex observations were performed by an Engineer-in-Training who is not trained or qualified to analyze geologic conditions and log field investigation borings.
- v. Observations were based on the limited field sampling that was conducted. Data is lacking to create a geologic map and geologic cross-sections that illustrate the site geologic conditions.
- vi. Insufficient surface and subsurface information is available from the Converse report to determine the earth materials that are present, and the geologic structure of the site.
- vii. The Converse report did not recognize a significant landslide in the central hill of the project site present for more than thirty years (see Google Earth attachment), which is vulnerable to further sliding.

viii. Orientations of bedding planes at northwest portion of site were based on limited borings and are opposite to all relevant published geologic mapping.

ix. Inconsistencies in bedding plane orientation reported by Converse versus published geologic mapping is not explained or reconciled.

x. Converse concludes bedding planes near Regal Canyon Drive homes are oriented into the slope and stable, while all relevant, published geologic mapping shows bedding is oriented out of the slope and unstable to these homes and properties.

xi. The project results in potential significant negative impacts to Grand Avenue, including effects of potential liquefaction and induced settlement from adjacent earthfill over alluvial materials if left in place.

xii. Poorly defined and inadequate removal of unsuitable soils proposed can result in earthfill and foundation instability of the project, including placement of earthfill over an active landslide.

### **3. Review of the Geologic and Geotechnical Information**

Several documents were reviewed in order to understand the geologic conditions underlying the site. The Converse report was based on subsurface exploration consisting of drilling, logging, and sampling various diameter borings in May 2014. Their investigation also included laboratory testing.

#### **a. Partial Listing of Geologic and Engineering Documents Reviewed**

i. Regional Geologic Map Generated by T.W. Dibblee (1989).

ii. Geologic and Landslide Potential Maps (Plates I and II), generated by the Los Angeles County Engineer for the City of Walnut as part of their General Plan (1974).

iii. Converse Consultants, Geotechnical Study Report, Proposed Fill Placement at the West Parcel, December 19, 2014.

iv. Psomas, Undated, South Campus Site Improvements - West, Mount San Antonio College, Undated.

v. UWT Engineering Geologist expert knowledge of geologic formations present at the site.

**c. Preliminary Findings of Relevant Geological Mapping Review of West Parcel - T.W. Dibblee (1989), LA County Engineer (1974) and UWT Engineering Geologist (2017)**

i. The Dibblee Regional Geologic map (1989) indicates the site is underlain by bedrock of the Tertiary Sycamore Canyon Formation and that bedding is generally striking northwest southeast and dipping to the northeast. The surrounding areas are indicated as being underlain by the Tertiary Yorba member of the Monterey (Puente Formation) with similar bedding orientations.

ii. The LA County Engineer, 1974, geologic map indicates, the site is underlain by bedrock of the Puente Formation. The central knob and adjacent hilltops are indicated as being underlain by sandstone and conglomerate, however, the lower portions of the hills are indicated as being underlain by the shales and siltstones.

iii. UWT Engineering Geologist observations confirm findings of the LA County Engineer (1974) and T.W. Dibblee (1989) geologic mapping.

iv. UWT Engineering Geologist observes bedding dip is generally east and sandstone and conglomerates are present. Where the shale and siltstone was observed, bedding dips to the east-northeast (similar to as indicated by T.W. Dibblee [1989]).

**d. Converse Geological Investigation Does not Reveal Low Strength Silts and Shales and Presents Other Significant Omissions**

i. Converse report indicates, "*the site is underlain by hard, cemented sandstone pebble conglomerate bedrock*". There is no mention of the presence of siltstone and/or shales, indicative of lower strength materials, which could result in unstable conditions in overlying earthfill.

ii. The low strength of numerous observed laminations and bedded siltstones are not emphasized as they affect the stability of the overlying earthfill.

iii. There are few notations of earth materials encountered.

iv. Geologic contacts between the differing geologic materials are not indicated and no structural information (such as bedding orientations) is provided.

v. Site-specific geologic structural information is only discussed in the text as it relates to a single large-diameter bucket auger boring, indicating bedding that was generally dipping northwest

vi. The above cited northwest bedding dip by Converse is nearly opposite of the regional bedding orientations indicated on the T.W. Dibblee Regional Geology map (1989) and LA County Engineer geologic mapping (1974).

ix. Converse's observations from infrequent samples in the small diameter borings indicated bedding which had near horizontal to near vertical dips. These inconsistencies are not presented or explained in the report.

The above statements and observations by Converse could potentially lead to conclusions that bedding orientations are generally into the slope and westerly, suggesting hillsides and hillside cuts are stable. In fact, there is evidence that actual bedding orientations dip out of the slope, as represented on all relevant geologic maps and field observation by our Engineering Geologist, resulting in unstable conditions.

#### **4. Need for Qualified Personnel to Perform Geologic Field Observations**

##### **i. Inadequacies of Converse Field Observation Personnel**

i. A Geologist or Engineering Geologist should perform a geological study, including direct observations of geologic field conditions such that field conditions are not overlooked or misinterpreted.

ii. An Engineer-in-Training who is not trained to analyze geologic conditions logged borings and performed field observations.

iii. Field observations were based on the limited field sampling that was conducted.

iv. Converse field personnel overlooked an obvious and significant landslide that occurred on the central hill area of the site that by expert review of historical photographs took place several decades ago.

v. Improper field observations can lead to conclusions affecting the safe installation the project, but also the safety of adjacent properties and residences.

The practical consequence of inadequate field observations is that up to seventy (70) feet of earthfill would be placed over unmitigated landslide rupture surfaces, typically exhibiting low strength and subject to further movement, adjacent to a highly-travel public road. As noted below, limited sampling in other areas compromised liquefaction analyses and the consequences of bedding plane orientations on adjacent properties and residents.

#### **5. Landslides/Mass Movements**

##### **a. Deficient Landslide Analysis Overlooked a Significant Existing Landslide at Grand Avenue and Other Adverse Geologic Features**

i. Government codes and guidelines require a discussion of the potential for landsliding at any hillside site in California.

ii. No landslide analyses of mass movements/landsliding were conducted by Converse nor were landslides shown on any of their maps, cross-sections or indicated in the text of the report.

iii. No discussion is provided in the report other than relating to seismically induced landslides, which by site evidence does not account for existing landsliding that has occurred along Grand Avenue more than thirty years ago after the four-lane road was established.

iv. Aerial imagery from Google Earth clearly indicates landslide(s) exists on the eastern side of the central knob descending down to Grand Avenue (see attachment). The landslide area on the central hill is present in aerial imagery dating from after 1980 until the present.

v. The above referenced landslide is further validated through field visits to the site by our Engineering Geologist and former City officials with first-hand knowledge of at least two landslides that occurred at the subject site after Grand Avenue was expanded to four lanes.

vi. At least one of the above landslides at the central hill of the site closed the road (Grand Ave.) and covered all the lanes. In addition, siltstone and shale bedrock with eastward dipping bedding subject to landsliding was observed in this area.

vii. In addition to the landslide(s) discussed above, review of aerial imagery indicates other areas of the site, which may be underlain by landslides, or have the potential for landsliding.

viii. Geologic cross-sections were not prepared to show landslide extent and no stability analyses were conducted to determine if earthfill slopes or cuts in natural slopes were feasible.

ix. The Converse report did not reference the LA County Engineer Landslide Potential Map (1974) that indicates significant portions of the site have a High Landslide Potential (Plate II). Such a report is typical of city planning initiatives and is an obvious document to be sought out and reviewed.

x. Essentially any of the east facing slopes that are underlain by thinly bedded (laminated) bedding has a potential for landsliding. There are also several geomorphic features of the site that may be indicative of landsliding, but not investigated and analyzed by Converse.

The consequence of not identifying the landslide was that significant earthfill would have been placed over landslide rupture surfaces without any remedial measures, making it subject to future landsliding. The public safety consequences of a potential landslide on the highly traveled Grand Avenue are apparent.

## **6. Liquefaction**

### **a. Abbreviated and Poorly Scoped Liquefaction Analysis Overlooked Liquefaction Potential Below the Proposed Earthfill and Near Grand Avenue**

i. The Converse report identified portions of the site as having a potential for liquefaction according to the state of California (CGS, 1999).

ii. Several borings were excavated in these areas, but Converse conducted liquefaction analysis for only one of the borings.

iii. This boring was located in the southern canyon area where the alluvial deposits were the shallowest, and analyses concluded that the site was not susceptible to liquefaction and significant seismic settlement.

iv. Converse did not conduct liquefaction analysis for the northern canyon area where alluvium was deepest and more indicative of conditions subject to liquefaction.

v. Two borings that were excavated closer to the northern canyon were terminated without encountering bedrock.

vi. Groundwater was encountered in both these borings along with some loose alluvium typical of liquefiable materials. However, these boring were not analyzed for liquefaction potential.

vii. None of the above borings were excavated along the axis of the canyon or at the lower end of the canyon where the alluvium would be the deepest, groundwater would potentially be the shallowest, the potential for liquefaction would be the greatest.

viii. The total depth of alluvium was not modeled or investigated near Grand Avenue within this canyon.

ix. No analyses were conducted to determine the total depth of alluvium and obtain subsurface information the full length of the canyon for a proper liquefaction evaluation.

The groundwater observations, loose alluvial deposits encountered and deeper alluvium suggest susceptibility to liquefaction and potential instability in the overlying proposed earthfill and nearby Grand Avenue.

## **7. Slope Stability**

### **a. Vital Slope Stability Analyses Were Omitted Throughout the Converse Document**

i. Geotechnical reports generally require slope stability analyses for cut and fill slopes, including the highest fill slopes.

ii. Most agencies require proposed cut slopes over about 10 feet in height to be analyzed for geologic conditions and to determine orientation of bedding or other weak features.

ii. Out-of-slope bedding, as is the case at the West Parcel, requires specific analyses of these features.

iii. No geologic cross sections or geologic interpretations were prepared. Regional bedding attitudes and bedding observed by our Engineering Geologist elsewhere at the site indicated a significant potential for weak siltstone bedding dipping out of the slope.

### **b. No Stability Analysis Was Conducted for Cut Slopes, Including Critical Cut Slope Near Homes at Regal Canyon Drive**

i. There are several proposed slopes that lack sufficient geologic information to prepare a geologic cross-section and/or conduct slope stability analysis.

iv. No stability analyses were conducted near homes at the northwest portion of the site, despite published adverse out of slope bedding recorded at the highest cut slope on the project.

v. The slope of most concern is the cut slope described above, proposed in the northwest portion of the site up to 40 feet in height, and located directly behind several existing homes.

vi. The report stated that the proposed cut slope would have neutral to favorable bedding attitudes due to the bedding observed in only one large diameter boring and very limited field sampling.

vii. However, published geologic mapping by T.W. Dibblee (1989) and the LA County Engineer (1974) show near opposite and adverse bedding orientation out of the slope similar to other bedding orientations on the project.

viii. Converse provides no explanation of the above inconsistency.

ix. Two smaller borings in this area found siltstone with no apparent bedding. However, an Engineer-in-Training who is not trained to analyze geologic conditions

logged these borings, and the observations were based on the limited sampling that was conducted.

x. The proposed high cut slope would potentially remove natural resisting forces to landsliding along these beddings planes and could represent a significant hazard to offsite properties and existing homes at this location along Regal Canyon Drive.

**c. Vulnerable Orientation of Easterly Dipping Bedding Planes are Not Highlighted in Converse Report**

i. The landslide at the central hill along Grand Avenue likely took place along easterly out of slope bedding orientations.

ii. Necessary removals of loose alluvium or removals in areas with High Landslide Potential could concurrently remove hillside materials that provide resisting forces to landsliding.

iii. The above condition would likely apply to homes and properties on Regal Canyon Drive (to the west) and on Stonybrook Drive (to the east) since slopes near these properties have essentially the same bedding orientation observed at the central hill.

**d. Existing Landslide at Grand Avenue Posing Risk to Earthfill Project Was Overlooked**

i. The slope along Grand Avenue consists of variable cut, fill, and in some locations, fill over the existing slope.

ii. The central portion of the Grand Avenue site is underlain by the landslide.

iii. The proposed cut slope in this area will most likely not remove all the landslide debris, and the underlying cause(s) of the landslide.

iv. Additional landslide movement can potentially occur with the placement of overlying earthfill and without removing all landslide rupture surfaces.

v. The geologic conditions have not been modeled by Converse for the differing conditions along the length of this slope nor has the existence of the landslide been identified.

**8. Remedial Removals and Measures to Mitigate Landslide Mass Movements**

**a. Project Description of Remedial Soil Removals is Poorly Defined**

i. Converse report states that “loose, disturbed or unsuitable alluvial soils” is to be removed from the surface of the West Parcel site before placing earth fill.



ii. The above statement is difficult to interpret and is not well defined as to the precise depths and/or criteria for remedial soil removals on the project site. A definition of “loose and unsuitable soils” is also not provided within the report.

iii. Based on the alluvial deposits encountered in Converse borings, remedial soil removal would likely be at least 20 feet in depth.

iv. Removal of landslide materials are likely greater than 20 feet in depth and could at least double earthwork quantities for the project.

**b. Remedial Soil Removals May Result in Destabilizing Adjacent Natural Slopes**

i. At the south end of the project, hillsides would be undercut by remedial soil removals and preparations for earthfill placement, and would potentially be destabilized because of out of slope bedding, along with adjacent properties and homes along Stonybrook Drive.

ii. UWT Engineering Geologist recommends that the extent of soft, yielding soils cited by Converse should be explicitly defined in order to address remedial removals.

iii. Similar to the above soft, yielding soil conditions, the LA County Engineer Geologic and Landslide Potential Maps (1974) depict unsuitable soil and geologic conditions over a substantial portion of the site.

iv. The occurrence of an existing landslide at the site suggests potential for landslides with similar east facing slopes, underlain by thinly bedded (laminated) east-facing bedding.

v. The need to remove unsuitable alluvial soils is demonstrated in areas with High Landslide Potential on the 1974 maps, which left unmitigated could lead to instability in proposed earthfill and foundation materials.

**c. Placement of Earthfill over Alluvium Poses Potential Risk of Settlement of Earthfill and Induced Settlement of Grand Avenue**

i. Removal of alluvium along Grand Avenue, where the alluvium will be the thickest, has not been discussed and/or modeled.

ii. If alluvium is remaining adjacent/beneath Grand Avenue and additional filling is proposed over the alluvium, then there is potential that this proposed condition will result in settlement under the earthfill, as well as induce settlement beneath Grand Avenue.

iii. Potential induced settlement of Grand Avenue and the underlying major utilities that likely exist within the road prism may be a significant issue.

iv. The above potential settlement conditions were not discussed or analyzed in the Converse report, leaving significant settlement issues and consequences unaddressed.

**d. Plan for Remedial Soil Removals Omitted from Plans**

i. Remedial soil removals were discussed by Converse however, estimated depths of removal and the criteria to determine if removals are sufficient were not provided.

ii. Remedial soil removal can affect many other issues including total and differential settlement, potential for collapse, and the stability of existing slopes.

iii. A remedial measure map was omitted that would indicate all the recommended remediation necessary for safely grading the site.

iv. Lacking clear definition of remedial removals, the integrity of the underlying foundation materials and proposed overlying earthfill cannot be determined, and remedial removals when defined can become a significant cost issue.

**e. Potential for Similar Landsliding from Slope Undercutting and Adverse Bedding Orientations Exists at Central Hill and Near Regal Canyon Drive**

i. The landslide at Grand Avenue occurred about 1980 shortly after Grand Avenue was widened to four lanes in the late 1970's, likely from the undercutting of the central hill near the roadway.

ii. Homes on Regal Canyon Drive were built between 1980 and 1995, separated by about 0.15 miles from the central hill by an intervening canyon.

iii. The proposed project grading would undercut hillside slopes north of these homes by up to 40 feet, potentially causing similar landsliding along out of slope bedding planes.

**Attachment**  
**Google Earth Image of Existing Landslide at West Parcel Site**

