Date: May 15, 2013

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Subject: **Preliminary revised fault map based on a geomorphic, structural, and stratigraphic evaluation in the Century City/Cheviot Hills area, California.**

This report provides a revised fault map (attached Plate KGS-FM1) for the Century City area based on new subsurface data, and evaluation of all existing data. The new fault map and findings in this report supersedes those provided by Kenney GeoScience in a report dated June 18, 2012. Since the time of the original KGS (2012) report, considerable new subsurface data has been published pertaining to local fault structure and activity in the area. These include:

- Leighton Consulting, Inc. (LCI, 2012a); Second response to California Geological Survey review comments, fault rupture hazard review, Beverly Hills High School, 241 South Moreno Drive, Beverly Hills, California, CGS Application No. 03-CGS0960; prepared for Hill, Farrer & Burrill, LLP; LCI Project No. 603314-008; report dated December 28, 2012.

- Leighton Consulting, Inc. (LCI, 2012b); Progress report of fault hazard assessment, El Rodeo K-8 School, 605 Whittier Drive, Beverly Hills, California; prepared for Hill, Farrer & Burrill, LLP; LCI Project No. 603367-002; report dated June 29, 2012.

- Feffer Geologic Consulting (Feffer, 2012); Report of fault rupture hazard investigation, 1000 Santa Monica Boulevard, Los Angeles, California; prepared for Crescent Heights; Feffer Project No. 494-64; report dated August 24, 2012.

- Legg Geophysical, Inc. (Legg, 2012a), Independent review of Metro Century City area fault investigation report Appendix D; report data January 27, 2012.

- Legg Geophysical, Inc. (Legg, 2012b), Update report for “Independent review of Metro Century City area fault investigation report Appendix D”; report dated May 10, 2012

The revised fault map provided with this report is also based on a re-evaluation of the pre-existing subsurface data from the Parsons (2011) fault hazard report for the area, which was the primary data utilized in the June 2012 KGS report. Numerous conversations with Eldon Gath (Earth Consultants International) also provided useful regional structure insights. The new fault map is provided as an attachment (Plate KGS-FM1). A revised KGS fault report to supersede the KGS (2012) is being prepared.

ATTACHEMENTS

PLATE KGS-FM1	(Revised Preliminary Fault Map of Study Area)
FIGURE 1	(Preliminary Fault Map with Natural Topography)
FIGURE 2	(Preliminary Regional Fault Evaluation Map)

FINDINGS

Significant and also subtle interpretation changes in stratigraphy and structure were identified during preparation of the revised fault map.

Stratigraphy

The primary change to the local stratigraphy involves the subdivision of the older Benedict Canyon Wash Deposits (BCWD) into two members. These are referred to as BCWD1 (younger) and underlying BCWD2. Contrary to the KGS (2012) report, it appears that the BCWD2 may be 10 to 25 feet thick across some of the local preserved fan surfaces within the Cheviot Hills (study area) which were originally referred to as the 300T fan terraces exposing Cheviot Hills Deposits (CHD). The limits of BCWD1 reside in a similar area as the BCWD shown in the KGS, 2012 report. In addition, these new stratigraphic interpretations indicate that some of the local "300T" preserved fan surfaces were abandoned near the time of the transition between BCWD1 and BCWD2. Additional soil pedon stratigraphic reports have also been conducted that have provided better resolution of the age of the BCWD. These reports include one by John Helms, CEG, which is included in the Feffer (2012) fault study at 10,000 Santa Monica Boulevard, and by Tania Gonzalez, CEG, with Earth Consultants International (ECI), which is included in the LCI (2012a) report for Beverly Hills High School. The soil stratigraphy report provided by John Helms, CEG provides the most detailed and complete description and numerical ages yet compiled for the BCWD1 and upper BCWD2. The exposures in the Feffer (2012) fault trench essentially exposed the entire BCWD1 section, and the uppermost members of the BCWD2. Soil ages provided by Tania Gonzalez were conducted along Transect C-C' and fault Trench FT-5 in Beverly Hills High School (LCI, 2012a). Numerical soil ages provided by these studies supported the stratigraphic model proposed by KGS (2012) however, these ages indicate that the age of the BCWD is likely older than originally proposed. These data will be discussed in more detail in the revised KGS report.

The other stratigraphic variation from the recent analysis involves the marine Lakewood Formation. This unit was mostly ignored in the KGS (2012) report, but was evaluated more fully recently. The Lakewood Formation resides above the San Pedro Formation in Transects 1-8 and 3 primarily south of Santa Monica Boulevard. The new interpretation of the Lakewood Formation is that this unit may interbed with members of the terrestrial Cheviot Hills deposits and possibly even with upper members of the San Pedro Sequence (marker beds E, F, Qfob and Qeb from KGS, 2012). If this is true, it indicates that a shoreline occurred in the local Cheviot Hills during the time of Lakewood Formation deposition. It is difficult to evaluate whether the Lakewood Formation should be included as part of the original San Pedro Sequence (SPS) or the CHD as defined by KGS (2012) due to the evaluation that it may be interbedded with both of these units.

Structural variations

Some faults have now been identified in regions where relatively steep dips (4 to 5 degrees) in the San Pedro Sequence (SPS) were originally identified in KGS (2012). It was determined however based on the detailed subsurface data of LCI (2012a), which provided relatively closely spaced borings along their cross sections A-A' and C-C' (Plate KGS-FM1), that the steep dips are likely not real and instead are due to faulting. Similar stratigraphic "steps" in members of the SPS were observed in Transect 2E, Transect 4 and LCI (2012a) cross section A-A'. It seems reasonable to deduce that this drop in elevation may not be the monocline axis as identified by KGS (2012) but instead is associated with faulting. Hence, this observation is one of the primary parameters that led to the identification of Fault Zone H (South Moreno Drive Fault Zone). The other example includes strands within Fault Zone F identified along LCI (2012a) cross section C-C' and KGS (this study) Transect 5. The LCI (2012a) data clearly identified a wider zone of faulting and that more vertical apparent offset had occurred in this fault zone than previously identified by KGS (2012).

Fault Zones

The new analysis identified four zones of faulting which are shown on Plate KGS-FM1 as Fault Zones A, F, G and H. Fault Zones A, F and G are considered to be part of the Santa Monica Boulevard Fault Zone (SBMBFZ) as defined by KGS (2012). The limits of the designated fault zones are <u>not</u> to be considered "fault set backs" or the limits of possible faulting in any way. Instead, the zones are intended to provide some insights on the anticipated style and type of faulting that will likely be identified during future studies and thus provide a useful tool for future work. These fault zones are briefly discussed below.

Fault Zone A trends northeast and away from Santa Monica Boulevard near the north end of Transects 3 and 1-8. Faults within this zone dip steeply toward the north and primarily exhibit apparent reverse displacement across the zone in addition to tilting (warping) toward the south. Faults associated with Fault Zone A continue toward the northeast and along the mapped scarp for the Santa Monica Fault Zone of Dolan and Sieh (1992) and based on evaluation of the LCI (2012b), likely to the El Rodeo K-8 School (Figure 1). The total vertical apparent offset across Fault Zone A ranges from approximately 55 to 80 feet. The best current estimate for total apparent dip-slip motion on Fault Zone A is likely closer to approximately 80 feet as identified by LCI (2012b) at the El Rodeo K-8 School. The full extent of Fault Zone A is mostly unknown and limited by the extent of available field data. It may well be wider than shown particularly to the northwest. It may also curve and extend considerably further to the west and parallel to Fault Zone F (Figure 2).

Fault Zone F (KGS, 2012) trends sub-parallel to Santa Monica Boulevard and is likely the dominant zone and mode of faulting between the Mormon Temple and Beverly Hills High School (Figure 1). This fault zone exhibits primarily steeply north-dipping faults with a normal apparent offset. Some southward tilting and block rotations occur within this fault zone. At this time the nature of the eastern merging of Fault Zone F and Fault Zone H is unknown. Fault Zone F bifurcates (merges) into the northeasterly trending Fault Zone A primarily near the intersection of Transect 1-8 and Transect 2. The total vertical apparent offset across Fault Zone F ranges from approximately 70 to 85 feet. A strand of Fault Zone F (F5-3) was positively identified by LCI (2012a) in their Fault Trench FT-5 to reach the existing cut surface. LCI (2012a) determined that this fault in not active.

Fault Zone G is located south of Fault Zone F and represents a series of relatively small scale faults that trend sub-parallel to the SMBFZ. The faults identified in Fault Zone G are based on a more detailed review of the Parsons (2011) subsurface data along Transects 1-8 and -3, which includes geophysical seismic lines (Legg Geophysical, 2012a and 2012b), and the boring and CPT data. Based on the existing data, it is likely that additional small scale faults occur within this Zone and possibly outside of this zone which the existing data cannot resolve. The southeastward edge of Fault Zone G is unknown and essentially extends to the southern limits of the study area suggesting that it likely extends further south than the study area.

Fault Zone H is a series of northwest-southeast striking faults (~N50-60W) located in the general area east of South Moreno Drive. These faults are similar to those identified as the West Beverly Hills Lineament Fault Zone (WBHLFZ) by Parsons (2011) but with some primary differences. Fault Zone H strikes more northwesterly, is located more easterly, and does not trend parallel to the geomorphic West Beverly Hills Lineament (WBHL). It is unclear which faults identified on Transect 2E and Transect 4 connect with each other. One possibility is shown on Plate KGS-FM1; however, these faults may trend (correlate) in a more northwesterly trend than shown. Fault Zone H may connect to the south with the Newport Inglewood Fault Zone along the east side of the WBHL and/or on the eastern side of the southeastern Cheviot Hills. It is also possible that the SMDFZ may connect with some other fault zone east of the Newport Inglewood Fault Zone. Additional studies are warranted to evaluate the tectonic role of the SMDFZ. The displacement across various strands within Fault Zone H is down to the east. However, it should be pointed out that the dip direction of these faults is currently unknown. In other words, Plate KGS-FM1 shows the faults dipping toward the east and exhibiting an apparent normal dip-slip offset; however, these faults could dip toward the west and exhibit apparent reverse dip-slip displacement. This second scenario may be more plausible because it would account for an uplift mechanism of the eastern Cheviot Hills, and the development of the northward trending anticline discussed in KGS 2012)(see Figure 2). In fact, the small set of hills in the southeastern Cheviot Hills and east of the WBHL may have resulted from a restraining bend in the northern Newport Inglewood fault based on this scenario (Figure 2).

The structural relationship between Fault Zones F and H is currently unknown. Hence, it is unclear if both fault zones were active concurrently, or if one zone is younger than the other. The SMDFZ likely continues to the eastern edge of the study area and thus its total east-west width remains unknown. A possible correlation of the SMDFZ with the Newport Inglewood fault to the south is shown on Figure 2.

Type of slip on the Santa Monica Boulevard Fault Zone

As proposed in KGS (2012), the SMBFZ (Fault Zones A, F and G) is primarily strike-slip and has likely not exhibited significant net vertical displacement. This conclusion is supported by similar elevations of the top of the San Pedro Formation in the northern and southern areas of the study area across Fault Zones A, F and G (Plate KGS-FM1) and consistent with the KGS (2012) findings It appears that down-dropping associated with Fault Zone F is approximately equal to the uplift associated with Fault Zone A, thus causing the net elevation of the top of the San Pedro to remain relatively level at the north end compared to the south end of Transects 1-8, -3 and -7. Collectively the faults in Fault Zone G exhibit a relatively small net vertical displacement. The dominantly strike-slip behavior of the Santa Monica Boulevard Fault Zone indicates that the vertical apparent offsets observed across Fault Zones A, F and G could be attributed to numerous stratigraphic and structural parameters.

As proposed by KGS (2012), the dominant strike-slip motion across the SMBFZ suggests that this fault zone is an upper plate “secondary” fault zone to the primary basal left-lateral reverse Santa Monica Fault Zone. Accordingly, the basal left-lateral Santa Monica Fault Zone likely resides to the south of the study area and in the region initially proposed by KGS (2012).

The sense of slip (right- vs. left-lateral) of the Santa Monica Boulevard Fault Zone remains unknown. This issue was evaluated further and motivated by some good questions provided by Jerry Treiman with the California Geological Survey since release of KGS (2012). Many geomorphic, stratigraphic and structural approaches were utilized in an attempt to identify a “smoking gun” indicating one or the other mode of strike-slip faulting. However, some lines of evidences suggested right-lateral and others suggested left-lateral. Hence, the sense of strike-slip motion across the SMBFZ remains uncertain. This topic among others will be more fully analyzed in a revised fault report.

Fault activity

Fault map Plate KGS-FM1 provides a preliminary evaluation of fault activity. However, additional fault investigations are warranted to evaluate fault activity and more accurate fault locations and density for most of the identified faults. Faults were primarily observed during the re-evaluation of the Parsons (2011) transect data by identifying vertical separations of various soil marker beds and erosion surfaces in a very similar methodology as that described in KGS (2012). Thus, faults with small scale offsets that are dominantly strike-slip would be difficult to identify with the existing data. In addition, as indicated in KGS (2012), the resolution of the boring and CPT data generally provide a vertical resolution of approximately 3 to 5 feet. This value increases in some areas where the boring and CPT data density is less and/or the borings to do not extend to depths to identify deeper and older units.

All faults identified in the cross sections (Transects 1-8, 2, 2E, 3, 4, and 5) are shown on Plate KGS-FM1. Most of the faults were identified utilizing the boring and CPT data from various sources; however, some were primarily identified via geophysical data as indicted on Plate KGS-FM1. Fault Trench FT-5 by LCI (2012a) identified faults associated with Fault Zone F in very close proximity, with a similar dip direction and sense of apparent dip-slip motion as proposed by KGS (2012). However, KGS (2012) estimated that Fault F2 likely terminated at a depth of approximately 30 feet and the LCI (2012a) fault trench FT-5 identified similar faults within this zone extending to the existing surface (cut surface). Accordingly, these observations substantiate the vertical resolution of 3-5 feet proposed by KGS (2012) and should be considered for future investigations. The LCI (2012a) findings indicate that the identified faults in FT-5 are inactive.

In some instances, identified faults appear to be clearly overlain be a continuous and un-faulted stratigraphic structure (soil marker horizon, erosion surface, etc.). These faults are shown on Plate KGS-FM1 as likely inactive (blue). These faults should not be considered “inactive” in a regulatory sense and thus they do warrant further investigation. However, the recent evaluation of the existing subsurface data does provide evidence that suggests that they are inactive. In other instances, the data was insufficient to determine if an overlying un-faulted stratigraphic structure occurred above the fault and these faults are shown as “activity unknown” (red on Plate KGS-FM1). This definition is not intended to imply that these faults are active. It is simply indicating that based on the existing data, the activity of this fault remains unknown. The only exception to the activity level designation shown on Plate KGS-FM1 is fault F5-3 identified in LCI (2012a) fault trench FT-5. If only based on evaluation of the boring data, this fault would have been designated as “activity unknown” (red). However, the detailed analysis conducted by LCI (2012a) provided reasonable data and findings to indicate that this fault zone is inactive.

The “blue” and “red” designations shown are purely based on the evaluation of the fault along a particular transect. Thus, the activity level of faults within a particular fault zone (i.e. Fault Zone F, or Fault Zone H) were not influenced by data on parallel transects. For example, some faults within Fault Zone H along Transect 2E are shown as red (activity unknown), whereas similar faults within the same fault zone along Transect 4 are shown as blue (likely inactive).

Along transects, an attempt was made to show on the fault map (Plate KGS-FM1) areas where the subsurface data was relatively detailed to evaluate fault locations and activity. Portions of transects where subsurface data was sufficient to identify continuous (presumably un-faulted) Pleistocene age stratigraphic structures are colored either yellow, orange, green or blue signifying that the likelihood of faulting and in particular active faulting occurring along these sections is considered low. The color scheme is describe on Plate KGS-FM1 but essentially correlates with the age of the continuous stratigraphic structure. For example, yellow for Benedict Canyon Wash Deposits-1 (BCWD1), orange for Benedict Canyon Wash Deposits-2 (BCWD2), green for Cheviot Hills Deposits (CHD) and Lakewood Formation (Qlw), and blue for the San Pedro Sequence (SPS). If a transect section shows a green line for example, it indicates that continuous member(s) of the CHD were identified in the subsurface data (boring and CPT) suggesting that these members are not faulted. This approach identifies regions in the study area that likely do not exhibit faulting (has a color and no faults), in addition to showing areas that may exhibit inactive faults where blue faults cross the transects.

Transect sections without a color designation are typically within faults zones where the faults extend relatively close to the surface, and/or the density of subsurface data (borings and CPT) is insufficient to identify continuous stratigraphy. Hence, some of the non-colored transect sections (i.e. most of Transect 8) do not provide sufficient data to correlate the local stratigraphy. In either case, portions of transects without a stratigraphic color designation should be emphasized for additional “preliminary” subsurface studies to simply provide additional data to improve our understanding of the faulting in these regions. It should be pointed out that the original data provided along Constellation Boulevard by Parsons (2011) is insufficient to perform a detailed stratigraphic evaluation and it too would not have a stratigraphic control color designation. The only exception to this is the area where LCI (2012a) cross section A-A’ provides sufficient subsurface data to designate it as blue (not offsetting members of the San Pedro Sequence-SPS; see Plate KGS-FM1).

CONCLUSIONS

There are several refinements from the initial KGS report based upon the availability of new data and analysis. KGS conducted a complete review of all available raw data in the Cheviot Hills area. This review expanded the area analyzed particularly on the west side (addition of Parsons - Transect 3) and northward to the El Rodeo School. The study was conducted without predisposition to soil stratigraphy and fault evaluation of other parties.

The revised fault evaluation clearly indicates that faulting associated with the Santa Monica Boulevard Fault Zone occurs across nearly the entire study area. Faults exhibiting the relatively largest apparent dip-slip offsets are close to the originally mapped trace of the Santa Monica Fault Zone by Dolan and Sieh (1992) but with some differences. First, the fault zone clearly becomes wider (splays out) toward the east as it approaches Benedict Canyon and that the fault zone extends south of Santa Monica Boulevard across the entire study area and presumably even further south than the study area.

The cumulative evidence continues to strongly suggest that the SMBFZ is a secondary upper plate structure to the basal Santa Monica Fault Zone that is most likely located well to the south of Santa Monica Boulevard in the Cheviot Hills area.

It must be noted that the wide spacing of available borings especially within Century City continues to limit the ability to evaluate fault locations in the study area. For example, while the available data is sufficient to identify the probability of faults shown on Plate KGS-FM-1, many of the borings are too widely spaced to determine whether a discontinuity in the data represents a single fault or multiple faults. The nature of the fault zones identified makes it likely that there are additional faults in the various zones besides those mapped. In fact, that was one of the primary motivations to map fault zones A, F, G and H. More detailed investigations are required to map individual fault strands and to evaluate fault activity. Similarly, Fault Zones A, G and H may be substantially wider than shown on Plate KGS -FM1; the map merely reflects the extent of investigation data currently available.

The additional analysis has demonstrated that many of the faults previously identified by KGS are possibly inactive based on apparent continuation of un-faulted Pleistocene age sediments overlying the faults. However, most faults were identified by their vertical apparent separation, and the vertical resolution of the data evaluated in this report is 3 to 5 feet. Hence, faults with smaller vertical displacements, especially where the data density is relatively low would be difficult to identify. Another issue is that the Santa Monica Boulevard Fault Zone is likely dominantly strike-slip which infers that faults may not exhibit identifiable vertical separations. Other faults identified by KGS may well be inactive, but the available data is insufficient to determine level of activity.

The purpose of this map is to assist future investigations in terms of providing a basic understanding of the primary fault zones in the area and the general style of faulting that may be encountered in those areas. Additional fault investigations are warranted to satisfy State of California Fault Rupture regulations and guidelines for fault surface rupture (hazard) investigations.

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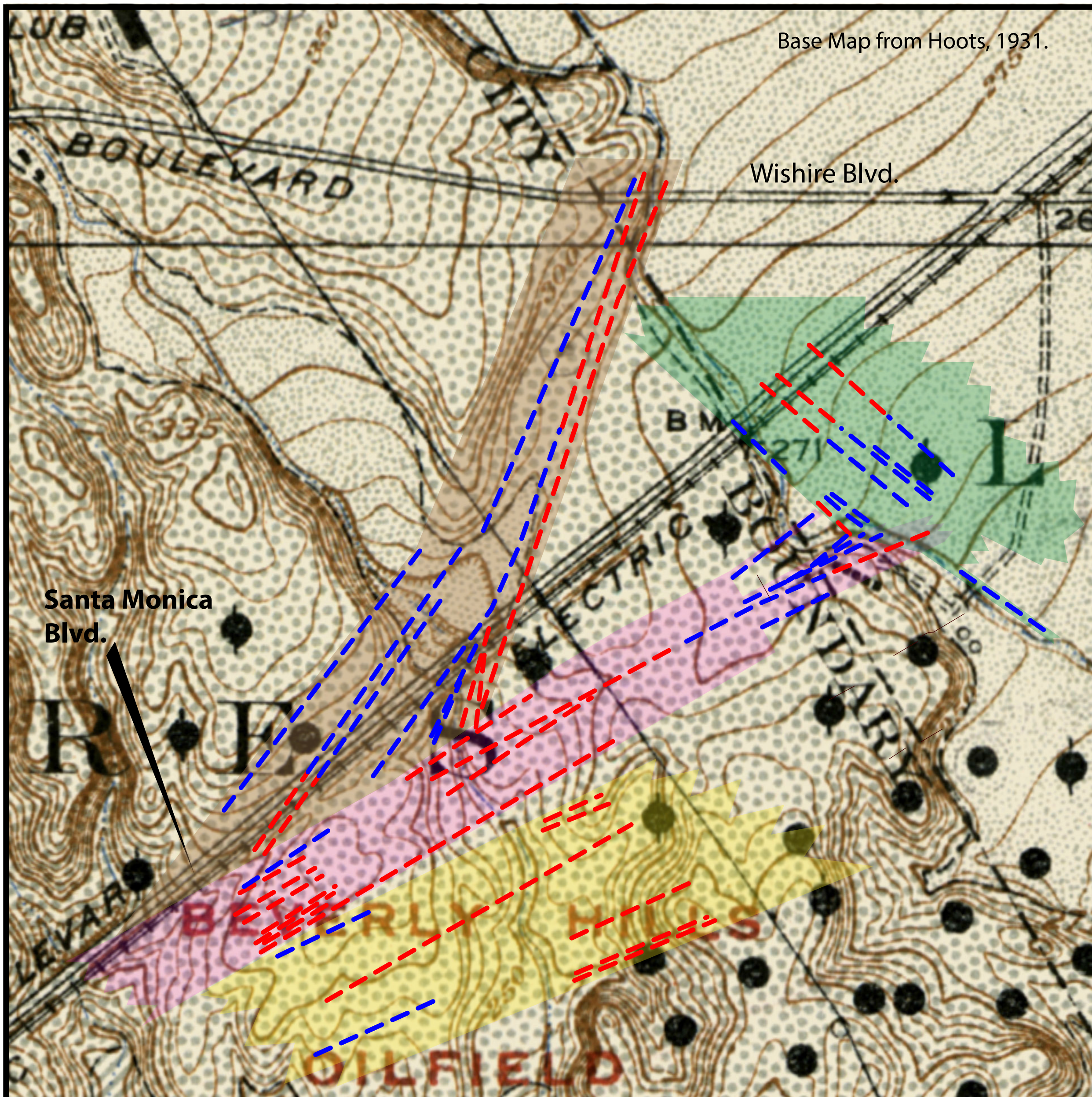
References

Dolan, J.F., Sieh, K, 1992; Tectonic geomorphology of the northern Los Angels basin: Seismic hazards and kinematics of young fault movement, in Engineering Geology Field Trips: Orange County, Santa Monica Mountains, and Malibu: Association of Engineering Geologists, 35th Annual Meeting, Field Trip Guide-book, p. B20-B26.

Parsons Brinckerhoff (Parsons), 2011; Century City are fault investigation, Volumes 1 and 2; report prepared for Metro; dated October 14, 2011; Parsons Project No.4953-10-1561.

Leighton …



FAULT LOCATIONS

- - - - (blue) Approximate location of fault that is possibly inactive based on evaluation of subsurface data

- - - - (red) Approximate location of fault in which activity is unknown based on evaluation of subsurface data

2000 feet

DESIGNATED FAULT ZONES

Fault Zones A, F, G and H: The limits of these designated fault zones are not to be considered fault setbacks in any way and are indended to generalize the location where similar styles of faulting occur and/or discrete/independent fault zones may occur

Fault Zone A - includes fault strands A, B, C, and E and is considered part of the Santa Monica Boulevard Fault Zone

Fault Zone F - includes various fault strands and is considered part of the Santa Monica Boulevard Fault Zone.

Fault Zone G - includes various fault strands and is considered part of the Santa Monica Boulevard Fault Zone.

Fault Zone H - includes numerous fault strands and is referred to herein as the South Moreno Drive Fault Zone.

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Kenney GeoScience

CLIENT:
HILL, FARRER & BURRILL LLP

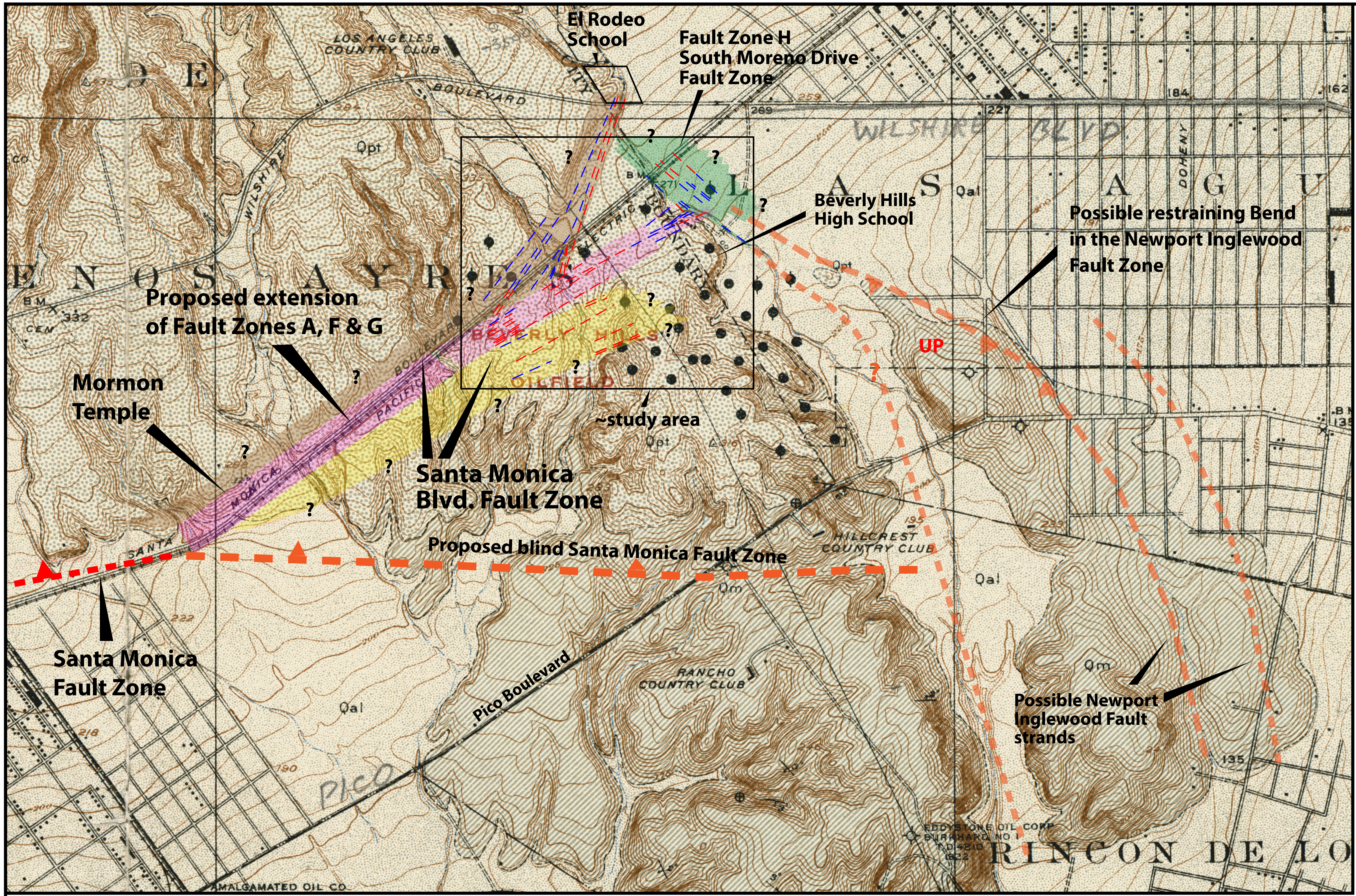
PROJECT:
GEOLOGIC EVALUATION OF THE SANTA MONICA FAULT ZONE IN THE CENTURY CITY AREA

PRELIMINARY FAULT MAP WITH NATURAL TOPOGRAPHY
Century City Area,
City of Los Angeles

Job No. 723-11
Date: MAY 2013
Drafted by: DV & MK

FIGURE 1


DESCRIPTION OF SYMBOLS (THIS STUDY)
TRANSECTS (CROSS SECTIONS)
TRANSECT 7
Approximate Transect (cross sections) locations evaluated during this study.
FAULT LOCATIONS
The individual fault locations shown were identified along transects from subsurface data (boring, CPT, geophysical, and trenches). The strike of the individual faults is unknown, however, general fault zones A, F, G and H are shown to provide what is believed to be reasonable general strike of faulting within these zones.
Approximate location of fault that is possibly inactive based on evaluation of subsurface data
Approximate location of fault in which activity is unknown based on evaluation of subsurface data
F7-1
ML3-5
T2E-4
F3-3a
F3-3b
Fault designation. Fault F7-1 is a fault in Fault Zone F on Transect 7, strand no. 1; fault ML3-5 is primarily based on Mark Legg Geophysical data (Legg, 2012a, 2012b), but may also be supported by other subsurface data as indicated, on Transect 3, fault strand no. 5; M2E-4 infers a fault within the South Moreno Creek Drive Fault Zone along Transect T2E, fault strand no. 4; Fault F3-3b is in Fault Zone F, Transect 3, fault strand no. 3 (note, the "a" and "b" indicates that Fault F3-3 merges into a single fault at depth.
Apparent dip-slip displacement identified
Apparent reverse slip displacement identified
FAULT PROJECTION TO SURFACE
Location shown on the map
Surface of earth
Vertical line projection from the top of the fault to the surface.
Fault
at depth
DESIGNATED FAULT ZONES
Approximate areas of designated fault zones A, F, G and H. The limits of these fault zones are not be considered fault set-backs in any way and are indended to generalize the location where similar styles of faulting occur and/or independent fault zones may occur. The edge of the fault zones where querried (?) reflect the limits of the evaluated subsurface data suggesting that these fault zone likely extend further.
Fault Zone A - includes fault strands A, B, C, D and E and is considered part of the Santa Monica Boulevard Fault Zone (SMBFZ).
Fault Zone F - includes various fault strands and is considered part of the Santa Monica Boulevard Fault Zone.
Fault Zone G - includes various small scale fault strands and is considered part of the Santa Monica Boulevard fault zone.
Fault Zone H - includes numerous fault strands and is referred to herein as the South Moreno Drive Fault Zone (SMDFZ). It is currently unknown what this fault zone connects with toward the southeast, but most likely involves the the Newport Inglewood Fault Zone.
Generalized strike and dip direction of underlying sedimentary units, typically of Cheviot Hills Deposits (CHD)/Lakewood Formation (Qlw) and/or San Pedro Sequence (SPS) age.
STRATIGRAPHIC CONTROL AREAS DEPICTING FAULT ACTIVITY
A color scheme utilized to depict fault activity based on stratigraphic control provided by evaluation of the subsurface data. For example, any section of trench depicting a yellow, orange, green or blue line (swath) as described below indicates that the subsurface data evaluation revealed sufficient control to suggest that unfaulted sediments of late Pleistocene age occur along this area. See inset Figures A and B for generalized stratigraphy and additional explanation for transect color designations.
Youngest
Some stratigraphic members of the BCWD1 appear continuous and not offset.
The BCWD1/BCWD2 contact is not offset and/or some stratigraphic members of the BCWD2 are not offset
The BCWD2/(CHD and/or Qlw) constact is not offset and/or some stratigraphic members of the CHD and/or Qlw are not offset
Oldest
The CHD or Qlw contact with the SPS is not offset, and/or some stratigraphic members of the SPS are not offset. This includes the upper contact of the San Pedro Formation.
FIGURE A - Diagramatic cross section of local stratigraphy and structure
SOUTH
NORTH
Terrace/fan surface at Beverly Hills High School (elevation ~280 - 290 feet).
Thin younger alluvium not shown at surface (~15-30 kya)
Top of BCWD1 (~30-70 kya)
Terrace/fan surface at El Rodeo Middle School (~elevation 305 feet)
BCWD2
BCWD1(200-300 kya)
BCWD2 (300 - 450 kya)
Qlw
CHD
CHD (>~450 kya)
SPS
SPS (Qsp)
SPS (Qsp) (~600 to 1000 kya)
Fault Zone F
Fault Zone A
FIGURE B - Fault activity color scheme
BCWD1
BCWD2
QLW &CHD
SPS
STRATIGRAPHIC NOMENCLATURE
BCWD1 Benedict Canyon Wash Deposits younger member - Quaternary (Pleistocene) terrestrial.
BCWD2 Benedict Canyon Wash Deposts older member- Quaternary (Pleistocene) terrestrial
CHD Cheviot Hills Deposits - Quaternary (Pleistocene) terrestrial
Qlw Quaternary Lake Wood Formation - marine, possibly interbedded with CHD and upper members of SPS.
SPS San Pedro Sequence - Quaternary. Members above the San Pedro Formation may be terrestrial, Underlying San Pedro Formation is marine.
FAULT ZONE A
FAULT ZONE F
FAULT ZONE G
FAULT ZONE H
FAULTING NOT EVALUATED
Unexplored Areas
Top of the San Pedro Formation (Qsp) at the El Rodeo School located approximately 760 feet to the north of shown map area along Transect 7 is at elevation ~173 feet
TRANSECT 7 continues to El Rodeo Middle School
TRANSECT 2 East (CPT = 34, Boring = 8) (Seismic Reflection Line Length = 1405')
TRANSECT 4 (CPT = 31, Boring = 10) (Seismic Reflection Line Length = 1284')
TRANSECT 7 (CPT = 29, Boring = 5) (Seismic Reflection Line Length = 1080')
TRANSECT 1 (CPT = 29, Boring = 8) (Seismic Reflection Line Length = 2252')
TRANSECT 2 (CPT = 23, Boring = 10) (Seismic Reflection Line Length = 1492')
TRANSECT 3 (CPT = 38, Boring = 8) (Seismic Reflection Line Length = 1144')
TRANSECT 8 (CPT = 15, Boring = 6)
Strike of the South Moreno Drive Fault Zone may be more northwestward than shown
Possible fault at depth
Dip unknown: It is possible that these faults dip toward the southwest and exhibit a reverse component of apparent dip-slip motion
Feffer/Geocon Fault Trench location Figure 6, Fault Rupture Hazard Investigation, report dated 8.20.2012.
Top of the San Pedro Formation (Qsp) at elevation ~223 feet
Top of the San Pedro Formation (Qsp) at elevation ~188 feet
Top of the San Pedro Formation (Qsp) at elevation ~206 feet
Top of the San Pedro Formation (Qsp) at elevation ~235 feet
Note: Faults E1 and E2 exhibit both normal and reverse apparent offset.
Fault locations primarily based on geophysical data and minor boring data.
Note: Subsurface data provided by Parsons (2011) Transect along Constellation Boulevard is currently inadequate to evaluate potenial faulting.
Fault based on geophysical and boring data.
Faults based on boring and CPT data.
Faults ML3-1 and ML3-2 based on geophysics data
Fault based on geophysics and boring data
Fault based on geophysics and boring log data
Dip direction unknown
Century City Santa Monica East Station Alternative
Century City Constellation Station Alternative
BEVERLY HILLS HIGH SCHOOL
SANTA MONICA BOULEVARD
CONSTELLATION BOULEVARD
AVENUE OF THE STARS
CENTURY PARK WEST
CENTURY PARK EAST
SO. MORENO DRIVE
LOS ANGELES
SYMBOL EXPLANATION FOR DATA FROM LCI (2012a)
Approximate location of continuous core boring locations CB-22 to CB-26 shown on accompanying cross sections C-C' and boring logs.
Approximat location of continuous core boring locations CB-1 to CB-21 shown cross sections A-A' and B-B'.
Fault Trench locations (approximate)
Geotechnical cross section which include fault trenches.
SYMBOL EXPLANATION FOR BASE MAP FROM PARSONS (2011)
Centerline of Tracks
Cross Passages (Approximate)
Alternative Station and Cross-Over Outline
Note: Missing CPT's and Borings on all Transects were not drilled.
N
0 50' 100' 200'
SCALE: 1" = 100'
Kenney GeoScience
CLIENT: HILL, FARRER & BURRILL LLP
PROJECT: GEOLOGIC EVALUATION OF THE SANTA MONICA FAULT ZONE IN THE CENTURY CITY AREA
PRELIMINARY FAULT MAP OF STUDY AREA
Century City Area, City of Los Angeles
Job No. 723-11
Date: MAY 2013
Drafted by: MK
PLATE KGS-FM1



DESIGNATED FAULT ZONES

Fault Zones A, F, G and H:
The limits of these designated fault zones are not to be considered fault setbacks in any way and are indented to generalize the location where similar styles of faulting occur and/or discrete/independent fault zones may occur

Fault Zone A - includes fault strands A, B, C, D and E and is considered part of the Santa Monica Boulevard Fault Zone

Fault Zone F - includes various fault strands and is considered part of the Santa Monica Boulevard Fault Zone.

Fault Zone G - includes various fault strands and is considered part of the Santa Monica Boulevard Fault Zone.

Fault Zone H - includes numerous fault strands and is referred to herein as the South Moreno Drive Fault Zone.

N

2000 feet

FAULT LOCATIONS IN STUDY AREA

Approximate location of fault that is possibly inactive based on evaluation of subsurface data in the study area (see Figure 1).

Approximate location of fault in which activity is unknown based on evaluation of subsurface data in the study area (see Figure 1).

Prossible location of faults not yet positively identified. Activity unknown.

Base Map from Hoots, 1931.

Kenney GeoScience

CLIENT:
HILL, FARRER & BURRILL LLP

PROJECT:
GEOLOGIC EVALUATION OF THE SANTA MONICA FAULT ZONE IN THE CENTURY CITY AREA

PRELIMINARY REGIONAL FAULT EVALUATION MAP
Century City Area,
City of Los Angeles

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FIGURE 2