PRELIMINARY GEOTECHNICAL EVALUATION
TAYLOR YARD BIKEWAY/PEDESTRIAN BRIDGE
LOS ANGELES DEPARTMENT OF PUBLIC WORKS
LOS ANGELES, CALIFORNIA

PREPARED FOR:
ICF International
601 W. Fifth Street, Suite 900
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May 26, 2016
Project No. 209403005

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Ms. Tamseel Mir
ICF International
601 W. Fifth Street, Suite 900
Los Angeles, California 90071

Subject: Preliminary Geotechnical Evaluation
Taylor Yard Bikeway/Pedestrian Bridge
Los Angeles Department of Public Works
Los Angeles, California

Dear Ms. Mir:

In accordance with your request and authorization, Ninyo & Moore has performed a preliminary geotechnical evaluation for the Taylor Yard Bikeway/Pedestrian Bridge project located in Los Angeles, California. Our evaluation was conducted in general accordance with the scope of services presented in our proposal dated May 29, 2015. This report presents our findings and conclusions regarding the subject site. We understand that the results of this evaluation will be utilized in the preparation of an Initial Study/Mitigated Negative Declaration for the project.

We appreciate the opportunity to provide geotechnical consulting services for this project.

Sincerely,
NINYO & MOORE

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SCM/MER/CAP/SG/mtf

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1. INTRODUCTION

In accordance with your request and authorization, we have performed a preliminary geotechnical evaluation for the Taylor Yard Bikeway/Pedestrian Bridge project (project) located in Los Angeles, California (Figure 1). The project involves the construction of a steel bridge across the Los Angeles River for bike and pedestrian traffic. The project site is located north of downtown Los Angeles at the location of the abandoned Taylor Yard railyard property on the north side of the river (Figure 2). The project is proposed by the City of Los Angeles Department of Public Works (LADPW) in cooperation with the Los Angeles Metropolitan Transportation Authority as part of the Los Angeles River Revitalization Master Plan. We have performed a geotechnical evaluation of the site geologic conditions and the impacts associated with potential geologic and seismic hazards for inclusion in the Initial Study/Mitigated Negative Declaration (IS/MND) for the project.

The purpose of our evaluation was to assess the geologic conditions at the site and develop preliminary conclusions regarding potential geologic and seismic impacts associated with the project in accordance with the California Environmental Quality Act (CEQA). Where appropriate, recommendations to mitigate potential geologic hazards, as noted in this report, have been provided. Our evaluation was based on review of readily available geologic and seismic data, geotechnical literature and reports, and site reconnaissance. Subsurface exploration was not conducted as part of our evaluation.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services has included review of geotechnical background materials, geologic reconnaissance of the project area, and geotechnical analysis. Specifically, we have performed the following tasks:

- Review of readily available topographic and geologic maps, published geotechnical literature, geologic and seismic data, groundwater data, and aerial photographs.
- Review of the geotechnical aspects of the preliminary project plans and project description documents pertaining to the site provided to us by ICF International (ICF).

- Review of a geotechnical engineering report for the project prepared by the LADPW dated June 9, 2015.
- Geotechnical reconnaissance by a representative from Ninyo & Moore conducted on April 21, 2016, to observe and document the existing surface conditions at the project site.
- Compilation and analysis of existing geotechnical data pertaining to the site.
- Assessment of the general geologic conditions and seismic hazards affecting the area and evaluation of their potential impacts on the project.
- Preparation of this report presenting the results of our study, as well as our conclusions regarding the geologic and seismic impacts on the project, and preliminary recommendations to address the impacts to be included in the IS/MND.

3. SITE DESCRIPTION

The project site is located east of Interstate 5 and north of Interstate 110 situated between the Elysian Valley community to the west and Mount Washington community to the east (Figure 1). The proposed northern bridge abutment is located adjacent to Kerr Road and an abandoned railroad track at the former Taylor Yard property. The proposed southern abutment is located at the Los Angeles River Bikeway trail between Altman Street and Dorris Place adjacent to a sanitation district equipment yard (Figure 2).

The site is located in a relatively flat valley bottom along the Los Angeles River drainage course. Topography of the river drainage slopes gently down toward the south/southeast. The northern river bank abutment location is situated at an elevation of approximately 340 feet above mean sea level (MSL) and the southern river bank abutment location is situated at an elevation of approximately 330 feet above MSL. The river channel bottom is elevated approximately 310 feet above MSL (Google Earth, 2016). The river channel bottom is unlined and is covered with coarse-grained gravel and sand deposits, vegetation and flowing water. The channel embankments are approximately 20 feet high, inclined at a gradient of approximately 3:1 (horizontal to vertical) and are lined with concrete (Google Earth, 2016).

4. PROPOSED PROJECT

The proposed Taylor Yard Bikeway/Pedestrian Bridge will connect the Elysian Valley neighborhood on the south side of the Los Angeles River with the Taylor Yard site and residential communities on the north side of the river. On the south side, the bridge will connect with an existing bikeway along the river channel, and on the north side, a new bikeway will be constructed along Kerr Road to connect with an existing bikeway along San Fernando Road. A proposed site plan is presented on Figure 2 (Tetra Tech, 2016).

Based on our review of the preliminary project plans and project description, we understand that the project entails construction of a multi-modal steel bridge over the Los Angeles River approximately 400 feet long and 30 feet high primarily for bicycle and pedestrian use. The bridge will be supported on abutments along the top of the channel and on a single bent in the central portion of the channel. The factored vertical and lateral loads at the abutments will range from approximately 600 to 900 kips and 140 to 1,200 kips, respectively. The factored vertical and lateral loads at the bent will be on the order of approximately 1,400 kips and 400 kips, respectively. A retaining wall, ranging in height from 5 to 15 feet, is planned for construction on the north abutment.

New bikeways will connect to existing bikeways along the Los Angeles River and on San Fernando Road. Additionally, the bridge will be designed to carry two Department of Water and Power reclaimed water pipelines, which will be placed underground on the east side and connect with a pipeline near San Fernando Road. An at-grade crossing of the existing railroad will be located on the north side.

5. GEOLOGY

5.1. Regional Geology

The subject site is located within the northeastern block of the Los Angeles Basin within the Transverse ranges geomorphic province of southern California (Norris and Webb, 1990). Geologically, the Los Angeles Basin and vicinity is divided into four blocks that include uplifted portions and synclinal depressions. The northeastern block is situated between the

Whittier fault zone and the base of the San Gabriel Mountains and is separated from the northwestern block by the Raymond Hill fault (Norris and Webb, 1990). The predominant structural feature is the deep synclinal basin that is comprised mostly of marine Cenozoic sedimentary rocks and includes some Miocene volcanic rocks. (Norris and Webb, 1990).

5.2. Site Geology

Regional geologic mapping indicates that the bridge abutments are underlain by Holocene-age alluvium and the bridge bent is underlain by Holocene-age stream channel deposits associated with deposition of sediments from the Los Angeles River (Dibblee, 1989). The alluvium is described as consisting of unconsolidated flood plain deposits of silt, sand, and gravel. The stream channel deposits are described as consisting of gravel, sand, and silt. A regional geologic map of the site vicinity is shown on Figure 3.

Fugro Consultants, Inc. (Fugro), performed a subsurface evaluation of the site in March 2014, for the LADPW consisting of drilling two mud rotary exploratory borings to depths of approximately 82 feet along both river bank abutment locations (Fugro, 2014a). In November 2014, Fugro drilled an additional mud rotary boring to a depth of approximately 67 feet in the river channel (Fugro, 2014a).

Fill and alluvium were encountered in the exploratory borings to the total depths explored. Fill was encountered to depths of approximately 19 and 20 feet at the location of the southern and northern abutments, respectively. The fill generally consisted of moist to wet, loose to very dense, silty sand and sand with variable amounts of gravel. Alluvium was encountered at the ground surface in the river channel bottom and underlying the fill at the abutment locations. The alluvium generally consisted of interbedded layers of wet, dense to very dense, silty sand, clayey sand, and sand with variable amounts of gravel.

5.3. Groundwater

Based on the subsurface exploration performed by Fugro in 2014 (Fugro, 2014a, 2014b), groundwater was encountered at depths of approximately 16½ and 18 feet below the river bank ground surface at the northern and southern abutment locations, respectively.

Groundwater was encountered at the surface in the river channel bottom. Based on our review of the California Geological Survey's (CGS's) (formerly known as California Division of Mines and Geology [CDMG]) State of California Seismic Hazard Zone report (1998), the historical high depth to groundwater is generally mapped at a depth of approximately 20 feet below the river banks in the site vicinity. Our review of readily available groundwater data on the State of California Water Resources Control Board's GeoTracker website (GeoTracker, 2016), indicates that the groundwater depth based on thirteen monitoring wells located within three miles of the site ranges from 5 to 57 feet below the ground surface.

Groundwater levels may be influenced by seasonal variations, precipitation, subsurface stratification, groundwater pumping, irrigation practices, and other factors and are subject to fluctuations. Shallow perched conditions may be present.

6. FAULTING AND SEISMICITY

6.1. Regional Fault Setting

The proposed bridge is located in a seismically active area, as is the majority of Southern California, and the potential for strong ground motion at the site is considered significant during the design life of the proposed bridge. The numerous faults in Southern California include active, potentially active, and inactive faults. As defined by the CGS, active faults are faults that have ruptured within Holocene time, or within approximately the last 11,000 years. Potentially active faults are those that show evidence of movement during Quaternary time (approximately the last 1.6 million years) but for which evidence of Holocene movement has not been established. Inactive faults have not ruptured in the last approximately 1.6 million years.

Table 1 lists selected principal known active faults within approximately 30 miles of the project area and the maximum moment magnitude (Mmax) as published by the United States Geological Survey (USGS, 2008) in general accordance with the Uniform California

Earthquake Rupture Forecast, version 3 (UCERF) (Field, et al., 2013). The fault distances in Table 1 are measured from the approximate center of the bridge.

Table 1 – Principal Regional Active Faults

Fault	Approximate Fault-to-Site Distance miles (kilometers)	Maximum Moment Magnitude (M_{max})
Upper Elysian Park Blind Thrust	1.4 (2.2)	6.7
Hollywood	1.7 (2.8)	6.7
Raymond	2.0 (3.3)	6.8
Santa Monica	3.0 (4.9)	7.4
Verdugo	4.2 (6.8)	6.9
Puente Hills Blind Thrust	6.7 (10.8)	7.0
Sierra Madre	8.5 (13.7)	7.3
Newport-Inglewood (Los Angeles Basin)	9.5 (15.2)	7.5
Elsinore	12.7 (20.4)	7.9
Clamshell-Sawpit	14.7 (23.7)	6.7
San Gabriel	15.7 (25.2)	7.3
Northridge	17.0 (27.3)	6.9
Malibu Coast	17.2 (27.8)	7.0
Anacapa-Dume	18.9 (30.4)	7.2
Palos Verdes	19.7 (31.7)	7.7
San Jose	20.8 (33.4)	6.7
Santa Susana	21.8 (35.1)	6.9
Chino	28.4 (45.7)	6.8
Cucamonga	29.1 (46.8)	6.7
Simi-Santa Rosa	30.1 (48.5)	6.9
San Andreas	31.4 (50.5)	8.2

Figure 4 shows the approximate site location relative to the principal faults in the region based on the Fault Activity Map of California (Jennings, C.W., and Bryant, W.A., 2010). The Upper Elysian Park Blind Thrust Fault and the Hollywood Fault are located approximately 1.4 miles southwest and 1.7 miles northwest of the site, respectively. Blind thrust faults are low-angle faults at depths that do not break the surface and are, therefore, not shown on Figure 4. Although blind thrust faults do not have a surface trace, they can be capable of generating damaging earthquakes and are included in Table 1.

7. METHODOLOGY FOR GEOLOGIC IMPACT AND HAZARD ANALYSES

As outlined by the CEQA, the proposed project has been evaluated with respect to potential geologic and seismic impacts associated with the project. Evaluation of impacts due to potential geologic and seismic hazards is based on our review of readily available published geotechnical literature and geologic and seismic data pertinent to the proposed project, and site reconnaissance. The references and data reviewed include, but are not limited to, the following:

- Geologic maps and fault maps from the CDMG, CGS and USGS.
- Topographic maps from the USGS.
- Seismic data from the CGS and USGS.
- Geotechnical publications by the CDMG, CGS and USGS.
- State of California EFZ Maps (formerly Alquist-Priolo Special Studies Zones Maps).
- State of California Seismic Hazards Zones Reports and Maps.
- Aerial photographs.
- Safety Element of the Los Angeles City General Plan.
- Site-specific geotechnical reports and plans prepared for the project, as indicated in the References section of this report.

8. THRESHOLDS OF SIGNIFICANCE

According to Appendix G of the CEQA guidelines (California Environmental Resources Evaluation System [CERES], 2005a, 2005b), a project is considered to have a geologic impact if its implementation would result in or expose people/structures to potential substantial adverse effects, including the risk of loss, injury, or death from hazards involving one or more of the geologic conditions presented in Table 2. Table 2 also presents the impact potential as defined by CEQA associated with each of the geologic conditions discussed in the following sections.

Table 2 – Summary of Potential Geologic Impacts/Hazards

Geologic Condition	Impact Potential[1]			
	Potentially Significant Impact	**Less than Significant with Mitigation Incorporation**	**Less than Significant Impact**	**No Impact**
Earthquake Fault Rupture			x	
Strong Seismic Ground Shaking		x		
Seismically Related Ground Failure, Including Liquefaction and Dynamic Compaction		x		
Landslides				x
Substantial Soil Erosion (excludes scour)		x		
Subsidence			x	
Compressible/Collapsible Soils		x		
Expansive Soils		x		
Groundwater and Excavations		x		

Note:
[1]Reference: CERES, 2005b, Appendix G – Environmental Checklist Form, Final Text, dated May 25. Website: http://ceres.ca.gov/topic/envlaw/ceqa/guidelines/appendices.html

9. CONCLUSIONS AND RECOMMENDATIONS FOR POTENTIAL GEOLOGIC AND SEISMIC IMPACTS/HAZARDS

Based on our review of geologic and seismic background information, and geotechnical reconnaissance, implementation of the proposed project is not anticipated to have a significant impact on the geologic environment. However, future development at the project site may be subjected to potential impacts from geologic and seismic hazards. Potential impacts on the proposed project based on our preliminary evaluation are provided in the following sections.

The potential geologic and seismic hazards described below may be addressed by employing sound engineering practice in the design and construction of the proposed project elements. This practice includes the implementation of appropriate geotechnical recommendations prior to the design and construction of the facilities at the project site. Typical methods to reduce potential hazards that may be encountered during the construction of improvements are described in the following sections. Where appropriate, recommendations to mitigate potential geologic hazards are provided.

9.1. Surface Fault Rupture

Surface fault rupture is the offset or rupturing of the ground surface by relative displacement across a fault during an earthquake. Based on our review of referenced geologic and fault hazard data, the project site is not transected by known active or potentially active faults. The active Upper Elysian Park Blind Thrust Fault and the Hollywood Fault are located approximately 1.4 miles southwest and 1.7 miles northwest of the site, respectively. The site is not located within a State of California Earthquake Fault Zone (Hart, E.W., and Bryant, W.A., 1997). Therefore, the potential for surface rupture is relatively low. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

9.2. Seismic Ground Shaking

Earthquake events from one of the regional active or potentially active faults near the project area could result in strong ground shaking which could affect the project site. The level of ground shaking at a given location depends on many factors, including the size and type of earthquake, distance from the earthquake, and subsurface geologic conditions. The type of construction also affects how particular structures and improvements perform during ground shaking.

The 2013 California Building Code (CBC) recommends that the design of structures be based on spectral response accelerations in the direction of maximum horizontal response (5 percent damped) having a 1 percent probability of collapse in 50 years. Such spectral response accelerations represent the Risk-Targeted Maximum Considered Earthquake (MCE_R) ground motion. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated as 1.13g using the USGS (2014b) seismic design tool (web-based). The mapped PGA (PGA_M) which is defined as the Maximum Considered Earthquake Geometric Mean (MCE_G) PGA with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard was estimated to be 1.08g using the USGS (2014b) seismic design tool in accordance with the ASCE 7-10 Standard. These estimates of ground motion do not include near-source factors that may be applicable to the design of structures on site.

This potential level of ground shaking could have high impacts on project improvements without appropriate design mitigation, and should be considered during the detailed design phase of the project. Mitigation of the potential impacts of seismic ground shaking can be achieved through project structural design. Structural elements of planned improvements can be designed to resist or accommodate appropriate site-specific ground motions and to conform to the current seismic design standards, including CBC and County of Los Angeles building regulations. Appropriate structural design and mitigation techniques would reduce the impacts related to seismic ground shaking.

9.3. Liquefaction

Liquefaction is the phenomenon in which loosely deposited granular soils located below the water table undergo rapid loss of shear strength due to excess pore pressure generation when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration results in the loss of grain-to-grain contact due to rapid rise in pore water pressure causing the soil to behave as a fluid for a short period of time. Liquefaction is known generally to occur in saturated or near-saturated cohesionless soils at depths shallower than 50 feet. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking. The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of slabs due to sand boiling, buckling of deep foundations due to liquefaction-induced ground settlement.

According to Seismic Hazard Zones Maps published by the State of California (CDMG, 1999), the project area is located within an area considered susceptible to liquefaction (Figure 5). This site was mapped as potentially liquefiable due to the shallow groundwater conditions in loose, younger alluvial sediments. The historical high depth to groundwater is mapped at a depth of approximately 20 feet below the river banks. Groundwater was encountered at the ground surface in the channel bottom and at a depth of approximately 16½ to 18 feet at the bridge abutments in 2014 (Fugro, 2014a, 2014b).

Assessment of the liquefaction potential at the project site was evaluated by LADPW in their report for the project dated June 9, 2015. The LADPW study found that, based on the subsurface exploration performed by Fugro, there are potentially liquefiable soils at the project site. A post-liquefaction settlement of approximately 1¼ inches was estimated based on the analysis by LADPW. To mitigate the potential impacts of seismically-induced settlement at the project site, LADPW recommended that the proposed bridge abutments be supported on a deep foundation system. Therefore, the potential impacts due to liquefaction are considered to be less than significant due to the mitigating effects of the deep foundation design recommended by LADPW.

9.4. Landslides

Landslides, slope failures, and mudflows of earth materials generally occur where slopes are steep and/or the earth materials are too weak to support themselves. Earthquake-induced landslides may also occur due to seismic ground shaking. The project site comprises a relatively flat river channel bottom and flat river banks separated by a moderately inclined, concrete-lined channel embankment approximately 20 feet high. Due to the covering of the river embankment with concrete, there is no potential for landslides or mudflows to affect the project site.

9.5. Soil Erosion

Erosion is a process by which soil or earth material is loosened or dissolved and removed from its original location. Future construction at the site will result in ground surface disruption during demolition, excavation, grading, and trenching that would create the potential for erosion to occur. Erosion can occur by varying processes and may occur at the site where bare soil is exposed to wind or moving water (both rainfall and surface runoff). The processes of erosion are generally a function of material type, terrain steepness, rainfall or irrigation levels, surface drainage conditions, and general land uses.

Based on our review of geologic references, previous site exploration and site reconnaissance, the materials exposed at the surface of the project site consist of sandy materials. Sandy soils typically have low cohesion, and have a relatively higher potential for erosion from surface runoff when exposed in cut slopes or utilized near the face of fill embankments. Surface soils with higher amounts of clay tend to be less erodible as the clay acts as a binder to hold the soil particles together. The potential impacts on the project related to scour in the river channel were not a part of our services. Scour potential should be evaluated during the design phase of the project.

Construction activities at the site may create the potential for soil erosion during excavation, grading, and trenching activities. However, a Storm Water Pollution Prevention Program incorporating Best Management Practices (BMPs) for erosion control is typically prepared prior to the start of construction to mitigate erosion during site construction. Typical BMPs include erosion prevention mats or geofabrics, silt fencing, sandbags, plastic sheeting, temporary drainage devices, and positive surface drainage to allow surface runoff to flow away from site improvements or areas susceptible to erosion. Surface drainage design provisions and site maintenance practices would reduce potential soil erosion following site development.

9.6. Subsidence

Subsidence is characterized as a sinking of the ground surface relative to surrounding areas, and can generally occur where deep soil deposits are present. Subsidence in areas of deep soil deposits is typically associated with regional groundwater withdrawal or other fluid withdrawal from the ground such as oil and natural gas. Subsidence can result in the development of ground cracks and damage to site improvements.

The City of Los Angeles and County of Los Angeles references do not indicate mapped areas of subsidence. Historic subsidence is not known to have occurred or been reported in the site region. The Safety Element of the Los Angeles City General Plan (1996) includes information regarding the City's program to preclude potential subsidence within the City. Subsurface extraction activities within the City of Los Angeles are regulated by the Oil Drilling District procedures, which contain provisions for monitoring and imposing measures to preclude subsidence related to oil and gas extraction. Therefore, the potential for subsidence in the project area is low.

9.7. Compressible/Collapsible Soils

Compressible soils are generally comprised of soils that undergo a decrease in volume when exposed to new loading, such as fill or foundation loads. Soil collapse is a phenomenon where the soils undergo a significant decrease in volume upon increase in moisture content, with or without an increase in external loads. Buildings, bridges and other structure foundations may be subject to excessive settlement-related distress when compressible soils or collapsible soils are present.

Based on our background review, existing fill was encountered at the abutment locations to depths ranging from approximately 19 to 20 feet. LADPW concluded that the existing, undocumented fill may be prone to static settlement. Additionally, the project area is underlain by alluvial deposits that are generally unconsolidated to weakly consolidated, based on the young nature of the deposits, reflecting a depositional history without substantial loading, and may be subject to collapse. Due to the presence of potentially compressible/collapsible soils at the site, there is a potential for differential settlement to cause damage to project improvements. The potential impacts of settlement are significant without appropriate mitigation during detailed project design and construction.

To mitigate the potential impacts of both static settlement and seismically-induced settlement at the project site, LADPW recommended that the proposed bridge abutments be supported on a deep foundation system. Therefore, the potential impacts due to settlement are considered to be low due to the mitigating effects of the deep foundation design recommended by LADPW.

9.8. Expansive Soils

Expansive soils include clay minerals that are characterized by their ability to undergo significant volume change (shrink or swell) due to variations in moisture content. Sandy soils are generally not expansive. Changes in soil moisture content can result from rainfall, irrigation, pipeline leakage, surface drainage, perched groundwater, drought, or other factors. Volumetric change of expansive soil may cause excessive cracking and heaving of structures with shallow foundations, concrete slabs-on-grade, or pavements supported on these materials.

Based on our background review and site reconnaissance, the near-surface soils in the project site are predominantly comprised of sandy, coarse-grained materials. Fugro encountered predominantly sandy soils in their borings at the site. These soils typically have a low expansion potential. However, clayey soils may be present in other areas of the project site. Due to the deep foundation system anticipated for the bridge, expansive soils are not anticipated to have a significant impact on the project. Provisions should be made during project construction so that shallow improvements, such as pavements or hardscape features, are not constructed upon highly expansive soils without appropriate mitigation.

9.9. Groundwater and Excavations

The depth of historic high groundwater at the project site is on the order of 20 feet below the ground surface of the river bank area (CDMG, 1998). Based on the subsurface evaluations performed by Fugro in 2014, groundwater was encountered at a depth ranging from approximately 16½ to 18 feet at the bridge abutment locations after the completion of drilling and groundwater was encountered at the ground surface in the river channel (Fugro, 2014a, 2014b).

Proposed future improvements at the project site are anticipated to consist of excavations and site grading for the bridge foundations and other miscellaneous improvements. Based on the shallow groundwater levels reported in the site region and the anticipated depth of construction activities, groundwater will be encountered in excavations for the planned project improvements, particularly during construction of the bent in the river channel.

Wet or saturated soil conditions encountered in excavations during construction for the project can cause instability of the excavations, and present a constraint to construction activities. Mitigation techniques should be developed during project design and construction to reduce the impacts of groundwater during construction. Excavations in areas with shallow groundwater may need to be cased/shored and/or dewatered to maintain stability of the excavations and adjacent improvements and provide access for construction. Construction of the bent in the river channel will need to have provisions to mitigate possible surface water and shallow groundwater impacts.

10. LIMITATIONS

The purpose of this study was to evaluate geotechnical conditions and potential geologic and seismic hazards at the site using readily available geotechnical data and site reconnaissance in order to provide a preliminary geotechnical report which can be utilized in the preparation of an IS/MND for the project.

The geotechnical analyses presented in this report have been conducted in general accordance with current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, implied or expressed, is made regarding the conclusions, recommendations, and professional opinions expressed in this report. Our preliminary conclusions and recommendations are based on a review of readily available geotechnical literature, geologic and seismic data, and an analysis of the observed conditions. Variations may exist and conditions not observed or described in this report may be encountered.

11. REFERENCES

ARUP, 2015a, Structural Report, Taylor Yard Bikeway Pedestrian Bridge, Issue 1, dated April 20.

ARUP, 2015b, Structural Report, Taylor Yard Bikeway Pedestrian Bridge, Issue 2, dated May 5.

California Building Standards Commission, 2013, California Building Code (CBC): California Code of Regulations, Title 24, Part 2, Volumes 1 and 2.

California Department of Conservation, Division of Mines and Geology, State of California, 1998, Seismic Hazard Evaluation of the Los Angeles 7.5-Minute Quadrangle, Los Angeles County, California: Open-File Report 98-20.

California Department of Conservation, Division of Mines and Geology, State of California, 1999, Seismic Hazard Zones Official Map, Los Angeles Quadrangle, 7.5-Minute Series: Scale 1:24,000, Open-File Report 98-20, dated March 25.

California Department of Transportation, 2016, Caltrans ARS Online (V2.3.07), http://dap3.dot.ca.gov/ARS_Online/.

California Environmental Resources Evaluation System (CERES), 2005a, The California Environmental Quality Act, Title 14; California Code of Regulations, Chapter 3; Guidelines for Implementation of the California Environmental Quality Act, Article 9; Contents of Environmental Impact Reports, Final Text dated May 25, Website: http://ceres.ca.gov/ topic/env_law/ceqa/guidelines/art9.html.

California Environmental Resources Evaluation System (CERES), 2005b, The California Environmental Quality Act, CEQA Guidelines Appendices, Appendix G – Environmental Checklist Form, Final Text dated May 25, Website: http://ceres.ca.gov/topic/env_law/ ceqa/guidelines/appendices.html.

Campbell, R.H., Willis, C.J., Irvine, P.J., and Swanson, B.J., 2014, Preliminary Geologic Map of the Los Angeles 30' x 60' Quadrangle, Southern California, Version 2.0: United States Geological Survey, Scale 1:100,000.

City of Los Angeles, 2015a, Task Order Solicitation EMGD-015, Taylor Yard Bikeway/Pedestrian Bridge Over LA River CEQA and NEPA Environmental Review, dated May 19.

City of Los Angeles, 2015b, Geotechnical Engineering Report, Taylor Yard Bikeway/Pedestrian Bridge Over the Los Angeles River Adjacent to 2331 Dorris Place, Los Angeles, California, W.O. #E1907487, Geo File #12-073, dated June 9.

County of Los Angeles, Department of Regional Planning, 1990, Los Angeles County Safety Element.

County of Los Angeles, Department of Public Works, 2016, Flood Zone Determination Website, http://dpw.lacounty.gov/wmd/floodzone/.

Dibblee, T.W., Jr., 1989, Geologic Map of the Los Angeles Quadrangle, Los Angeles County, California: Dibblee Foundation, DF-22, Scale 1:24,000.

Field, E.H., Biasi, G.P., Bird, P., Dawson, T.E., Felzer, K.R., Jackson, D.D., Johnson, K.M., Jordan, T.H., Madden, C., Michael, A.J., Milner, K.R., Page, M.T., Parsons, T., Powers, P.M., Shaw, B.E., Thatcher, W.R., Weldon, R.J., II, and Zeng, Y., 2013, Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) — The time-independent model: U.S. Geological Survey Open-File Report 2013–1165, California Geological Survey Special Report 228, and Southern California Earthquake Center Publication 1792, http://pubs.usgs.gov/of/2013/1165/.

Fugro Consultants, Inc., 2014a, Geotechnical Data Report, Taylor Yard Bikeway/Pedestrian Bridge Project, Los Angeles, California, Fugro Project No. 04.61130006, Phase 4, dated April.

Fugro Consultants, Inc., 2014b, Geotechnical Data Report, Taylor Yard Bikeway/Pedestrian Bridge Project, Los Angeles, California, Fugro Project No. 04.61130006, Phase 4, dated November.

Google Earth, 2016, Website: http://earth.google.com.

Hart, E.W., and Bryant, W.A., 1997, Fault-Rupture Hazard Zones in California, Alquist-Priolo Special Studies Zone Act of 1972 with Index to Special Studies Zones Maps: California Division of Mines and Geology, Special Publication 42.

Jennings, C.W., and Bryant, W.A., 2010, Fault Activity Map of California: California Division of Mines and Geology, California Geologic Data Map Series, Map No. 6, Scale 1:750,000.

Los Angeles Department of City Planning, 1996, Safety Element of the Los Angeles City General Plan, dated November 26.

Ninyo & Moore, 2015, Proposal for Peer Review of Geotechnical Report and Hazardous Materials Assessment for Initial Study and Mitigated Negative Declaration, Taylor Yard Bikeway and Pedestrian Bridge, Los Angeles, California, Proposal No. P04-00332, dated May 29.

Norris, R.M., and Webb, R.W., 1990, Geology of California: John Wiley & Sons, 541 pp.

State of California, 1977, Special Studies Zones, Los Angeles Quadrangle, 7.5 Minute Series: Scale 1:24,000, dated January 1.

State of California, State Water Resources Control Board, 2016a, GeoTracker Database System, http://geotracker.swrcb.ca.gov/.

State of California, State Water Resources Control Board, 2016b, Water Data Library, http://www.water.ca.gov/waterdatalibrary/.

Studio Pali Fekete Architects, 2016, Architectural Rendering, Rumble Fish, Taylor Yard Bikeway & Pedestrian Bridge Over the L.A. River.

Tetra Tech, 2016, Taylor Yard Bridge Plan Exhibit, dated March 23.

United States Geological Survey, 2008 National Seismic Hazard Maps – Fault Parameters; http://geohazards.usgs.gov/efusion/hazardfaults_search/hf_search_main.efm.

United States Geological Survey, 2014a, National Seismic Hazard Maps – Interactive Fault Map, http://earthquake.usgs.gov/hazards/qfaults/map/hazfault2014.html.

United States Geological Survey, 2014b, US Seismic Design Maps, US Seismic Design Maps Ground Motion Calculator – Version 3.1.0; http://earthquake.usgs.gov/designmaps/us/application.php.

United States Geological Survey, 2015, Los Angeles, California Quadrangle Map, 7.5 Minute Series: Scale 1:24,000.

Yerkes, R.F., and Campbell, R.H., 2005, Preliminary Geologic Map of the Los Angeles 30' x 60' Quadrangle, Southern California, Version 1.0: United States Geological Survey, Open File Report 2005-1019, Scale 1:100,000

AERIAL PHOTOGRAPHS

Source	Date	Scale	Flight	Numbers
USDA	12-4-52	1:20,000	AXJ-7K	90 & 91