

APPENDIX A
PROJECT TEAM QUALIFICATIONS

ROY J. SHLEMON & ASSOCIATES, INC.
Geologic and Environmental Consultants

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Quaternary Geology
Economic Geomorphology
Soil Stratigraphy
Geoarchaeology

ROY J. SHLEMON

SUMMARY OF RESUME

Education: B.A. Fresno State College, 1957
M.S. University of Wyoming, Laramie, 1959
Ph.D. University of California, Berkeley, 1967

University Positions (Teaching/Research):

Univ. California, Davis (Assistant Professor; and current Research Associate)
Louisiana State Univ., Baton Rouge (Assoc. Professor)
Stanford University (Consulting Professor, [part time])
Univ. California, Los Angeles (Lecturer [part time])
Calif. State Univ., Los Angeles (Lecturer [part time])
Univ. California, Irvine (Lecturer [part time])
San Diego State Univ. (Lecturer [part time])

Consulting Practice: (Principal, R. J. Shlemon & Assoc., Inc., Newport Beach)

Approximately 40-years, full-time consulting geologist specializing in Quaternary geology, geomorphology, geoarchaeology, soil stratigraphy and erosion and sedimentation control. Applications to engineering and engineering-geologic practice: fault-activity investigations (neotectonics/paleoseismicity), landslides, ground-fissure and differential settlement evaluations; independent and contract reviewer to government agencies and private organizations; forensic expert-witness testimony; Superior Court neutral referee (Orange County); advisory services and boards for U.S. Bureau of Reclamation, Corps of Engineers and other federal, state, local and international government agencies. Mining: Pleistocene auriferous and tin-bearing channels; sand and gravel deposits. Contaminant pathways: buried Pleistocene channel systems. Geoarchaeology: reconstruction of Quaternary environments, age of sediments and soils.

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Representative Applications:

Investigations for nuclear power plants, liquefied natural gas terminals, large dams, high- and low-level radioactive waste facilities, Class I-III landfills (California); assessment of ancient and modern landslides, origin and age; natural hazard appraisals, seismic risk; paleohydrology: flood frequency, natural vs anthropologic rates of erosion and sedimentation; standards of practice.

Professional Organizations and Service:

Professional Geologist, State of California (PG 2867).

Certified Professional in Erosion and Sedimentation Control (CPESC 2167).

Professional Geologist, American Institute of Professional Geologists (CPG 1766).

Member/Fellow approximately 25 international, national and local professional and honorary organizations.

Trustee and Vice-Chair Emeritus, Geological Society of America Foundation.

Director Emeritus, Engineering Geology Foundation (Association of Engineering Geologists).

North American Representative, Emeritus, International Geological Union, Commission on Geology for Environmental Management.

Member Emeritus, Technical Advisory Committee, California Board of Geology and Geophysics.

Trustee, University of Wyoming Foundation; Chair, Stewardship Committee.

Member, Board of Visitors, University of Wyoming, College of Arts and Sciences.

Member Emeritus, Independent Review Panel: Delta [California] Research and Management Strategy.

Senior Fellow: University of California, Davis, Division of Mathematics and Physical Sciences.

Trustee, University of California at Davis, Foundation; member Nominating Committee; Chair, Working Group on Stewardship.

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Member, Deans' Advisory Council, College of Letters and Sciences,
University of California at Davis; member, Development Committee.

Member, Advisory Council, Earth and Soil Science Program,
California Polytechnic University, San Luis Obispo.

Editor-in-Chief, Elsevier international journal "Engineering Geology."

Member, Technical Advisory Committee, California State Mining and
Geology Board, Geohazards Committee.

Member, Technical Advisory Council, Center for the Study of First
Americans, Texas A&M University.

Professional Awards/Recognition

National Science Foundation Educational Awards, 1960 through 1965.

"Best Paper Award" – 1985, "Applications of Soil Stratigraphy to
Engineering Geology," Bulletin, Association of Engineering Geologists.

"Distinguished Lecturer" – Richard H. Jahns Distinguished Lecturer,
Association of Engineering Geologists.

"Distinguished Practice Award" – Geological Society of America,
Engineering Geology Division.

"Honorary Member" – Association of Engineering Geologists.

"Scientific Achievement Award" – Orange County Engineering Council.

"Honorary Member" – American Institute of Professional Geologists.

"Outstanding Alumnus" – College of Arts & Science, University of
Wyoming, Laramie.

"Senior Fellow" – University of California, Davis, Division of Mathematics
and Physical Sciences.

"Outstanding Alumnus" – College of Mathematics and Sciences, Fresno
State University.

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Professional Awards/Recognition (continued)

“Recipient and Honoree” - Presidential Medal, Geological Society of America (Boulder, CO).

“Honorary Member”, South Coast Geological Society (Santa Ana, CA).

“Recipient and Honoree” – Presidential Citation, Association of Environmental & Engineering Geologists (Denver, CO).

Recipient: “Presidential Citation:” Association of Environmental & Engineering Geologists (Charleston, SC).

Publications:

Approximately 275 professional journal publications (monographs, articles, abstracts, reviews) since ~1965 dealing with mining (hydraulic and placer); and with Quaternary geology, geomorphology, geoarchaeology and soil-stratigraphic applications to engineering-geologic practice. Topics range from landslide and debris-flow recognition, risk and age, to delta formation, fault-activity assessments, anthropic-induced sedimentation and erosion, and cause of ground fissures and differential settlement. An additional 300 technical reports focus on site-specific investigations of faults, landslides, ground fissures and differential subsidence and other Quaternary geologic phenomena worldwide (list of publications and technical reports available upon request).

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Seismotectonic Investigations for Proposed and Existing Dams

Consultant services directly commissioned by governmental agencies or by engineering-geological firms involved in dam and damsite investigations. Representative seismotectonic (paleoseismic) investigations include the following existing and proposed dams.

- California:** Auburn, Folsom, Potrero, Black Butte, Cottonwood Creek, Anderson, Harvey Place, San Andreas, Crystal Springs, O'Neill, San Luis, Contra Loma, Bradbury, Glenn Reservoirs, New Melones, New Hogan, West Reservoir, Hidden, Buchanan, Pine Flat, Eastside Reservoir east and west dams (Domenigoni/Diamond Valley), Upper Chiquita;
- Arizona:** Roosevelt, Stewart, Mountain, Horseshoe, Bartlett;
- Colorado:** Two Forks, Twin Lakes;
- Montana:** Gold mining tailing dams and ponds;
- Utah:** Little Dell, SCS southern Utah embankment dams; Piute;
- Washington:** Mud Mountain;
- Colombia:** Bettania;
- Guatemala:** Chixoy.

Robert (Red) Robinson, LEG | Director of Underground Services

EDUCATION

Graduate Studies, Engineering Geology, University of Illinois
BS, Geology, University of California at Los Angeles

REGISTRATION

Licensed Engineering Geologist – WA
Certified Engineering Geologist – OR
Registered Geologist – OR

Red's technical experience includes subsurface exploration, design, plans and specifications, construction monitoring on projects such as tunnels, slope stabilization bridges, retaining walls, building foundations, and shafts in soil and rock. Much of his work over the last 30 years has dealt with various forms of underground construction on over 300 tunnels, including: drilled and raised bore shafts; horizontal directional drilling, pipe jacking, microtunneling, earth pressure balanced and slurry pressure balanced machines; 10- to 80-foot-diameter tunnels driven by roadheader, tunnel boring machine (TBM), and drill-and-blast methods; chambers up to 70 feet wide by 600 feet long; and solution mining, all in a wide range of soil and rock conditions.

Town of Truckee, “Mousehole” Replacement and Multi-use Pedestrian Tunnel, SR-89, Truckee, CA. Project manager for the conceptual level geotechnical assessment of ground conditions and tunneling construction approaches for twin double-lane highway tunnels and a pedestrian tunnel to replace an existing narrow double lane highway tunnel beneath the mainline Union Pacific Railroad tracks. The existing tunnel, built in 1928 is 25-foot wide and 68-foot long. The new replacement highway tunnels would be 45 feet wide and 85 feet long. Ground conditions consist of gravely sandy fill with cobbles and boulders over similar alluvium deposits. The new twin highway tunnels would likely be constructed by a sequential excavation process, involving sprayed shotcrete and steel rib support. The multi-use pedestrian tunnel would likely be excavated and supported by jacking a 12 to 15-foot pipe beneath the active railroad embankment.

City of Los Angeles, North Outfall Replacement Sewer, Los Angeles, CA. Red served as Project Tunnel Engineering Geologist. He reviewed geotechnical aspects and assisted in the preparation of plans, specifications, and a geotechnical design summary report (GDSR) for the North Outfall Replacement Sewer (NORS) in Los Angeles, California. The project included over 8 miles of main 10 to 15-foot diameter trunkline and diversion tunnel and passes beneath the Los Angeles International Airport, San Diego Freeway, expensive residential areas, and a number of oil fields with abandoned wells. Ground conditions include several major faults, potentially “gassy” conditions, and soils ranging from hard clays to clean, free-flowing dune sands and sections with alluvial soil containing cobbles and boulders. Specified tunneling approaches included earth pressure balance tunneling machines, gasketed segmented linings, and compressed air augmented with compaction grouting and chemical grouting for ground/settlement control.

WSDOT, Alaskan Way Viaduct Replacement SR 99 Bored Tunnel, Seattle, WA. Principal in charge/senior reviewer. Shannon & Wilson implemented geotechnical investigations and design input for 3 alternative alignments for a large tunnel to be driven by a closed-face tunnel boring machine. The tunnel will pass through a range of hard to dense glacially over-consolidated sticky and clogging clays, bouldery till, and abrasive sands and gravels, with up to 210 feet of soil cover, and 140 feet of groundwater head at tunnel crown. The alignment also passes beneath tall buildings, an active railroad tunnel, several sewers, and the existing viaduct. The minimization of ground loss and resulting settlements will be a critical issue.

Sound Transit, Link Light Rail Beacon Hill Section, Seattle, WA. Mr. Robinson served as principal-in-charge for a multi-phased geotechnical exploration program. He provided geotechnical design input for preliminary and final design, prepared and/or reviewed the geotechnical portions of plans and specifications, and assisted with construction management and ground behavior monitoring. The Beacon Hill section consisted of 1 mile of twin 18.9 ft diameter transit tunnels, a deep underground binocular station with twin 550-ft long by 36 ft diameter platform tunnels, one deep main and one deep ancillary ventilation and emergency egress shafts, a headhouse at the top of each shaft, a west portal structure beneath Interstate 5 and opening towards the downtown and an east portal structure that provides access to Rainier Valley. Twin tunnels were constructed with an EPB TBM and precast, gasketed, bolted concrete segments. The shafts are supported with slurry wall panels. The station tunnels were constructed by the sequential excavation method (SEM), with a variety of ground conditioning and support systems to accommodate the complex glacial soils. Explorations occurred over several phases and included 92 borings totaling 13,675 feet of mud rotary, split triple-tube rotary core and vibro-sonic borings, 3 test pits and a test shaft. A wide range of state of the art field tests, including: downhole pressure meter, downhole seismic velocity, and cross-hole tomography were used to define in situ soil properties.

Washington State Department of Transportation, Interstate 90 Mt. Baker Ridge Highway Tunnel, Seattle, WA. Project engineering geologist and project manager during CM phase. Prepared design recommendations, specifications, and developed and implemented a major monitoring program for the 80-foot inside diameter, 1,300-foot-long Mt. Baker Ridge highway tunnel, the world's largest diameter soft ground tunnel. Historically unstable slopes at each portal required special access pit designs including cantilevered cylinder pile walls and cut slope designs. Instrumentation included: inclinometer/sondex casings, multi-position sonic probe borehole extensometers, concrete stress meters, Carlson joint meters and linear potentiometer joint meters that were designed especially for this project, tape extensometers, and strain gages. Due to well written specifications and carefully thought out installation procedures, the instrumentation experienced a 95 percent survival rate after 5 years of construction. The semi-automated data collection systems and rapid computerized data reduction allowed the data from these instruments to be used to guide and control construction procedures and thus greatly reduced the potential for adverse ground behavior and damaging surface settlements.

King County Metro, Downtown Seattle Metro Bus Tunnel (Downtown Seattle Transit Project – DSTP), Seattle, WA. As Project Manager, participated in all phases of design and construction for the DSTP including 1.2 miles of twin 21-foot-diameter tunnel alignment and four cut-and-cover stations in saturated glacial soils and adjacent to up to 50-story buildings. Assessed potential “fatal flaw” for feasibility studies for the DSTP, including a review of geotechnical conditions along alternative alignments and methods for supporting or underpinning the Burlington Northern Railroad tunnel where it crosses the alignment. Assessed ground conditions and their impacts on tunnel construction methods and underpinning requirements for final design of the DSTP. Project Manager for the implementation of a comprehensive construction monitoring program for the DSTP, which included the monitoring and evaluation of ground and soil and water conditions, liner deformations, support stresses, building deformations, and the effectiveness of chemical and compact grouting, jet grouting, and ejector/eductors wells in a variety of glacial soil and water conditions ranging from flowing silts and dense to very hard bouldery clayey silty till. Reviewed submittals, evaluated construction procedures and assessed claims.

Lake Ft. Smith Dam, Ft. Smith, AR. Shannon & Wilson provided geotechnical design services and developed plans, specifications and the engineer's estimate for the construction of a new intake structure and tunnel for the Ft. Smith Dam. The structures consist of an intake tower built in a shaft on the shore of the lake, a 1,300 feet long multi-use tunnel and a portal structure. Lake taps will be performed from the intake shaft utilizing micro-tunneling methods. The tunnel will be used for the water supply pipes and construction phase flood control.

King County Bellevue Pump Station Upgrade Project, Bellevue, WA. Principal-in-Charge for the assessment of alternative alignments during the pre-design phase and for geotechnical recommendations, preparation of the Geotechnical Data and Interpretive Reports, and the development and/or review of geotechnical portions of the plans and specifications during the final design phase. The project will consist of an upgraded pump station and about 5,400 feet of new force main, constructed primarily by Horizontal Directional Drilling (HDD) techniques with trenching between the HDD sections...

King County WTD, Denny/Lake Union CSO, Seattle, WA. As Project Manager, Red directed a team of engineers, geologists and hydrogeologists in a multi-phased exploration program, developing design recommendations, and assisting with CM for a 6,000-foot-long, 15-foot O.D. CSO tunnel, access shafts, outfall pipe into Puget Sound, control facility, and treatment plant from Lake Union to Elliott Bay. The exploration program included: 30 borings, 2 pump tests, 20 slug tests, an in-depth laboratory program, design recommendations for tunnel excavation and support procedures, dewatering requirements, stabilization of liquifiable soils at the control facility, and support and anchoring systems for the subaqueous outfall. The tunnel was successfully constructed through glacial soils with over 200 feet of soil cover and with water heads greater than 100 feet. The tunnel was constructed with an earth-pressure balance tunnel machine (EPBM) and gasketed, bolted concrete segments.

King County WTD, Henderson CSO, Seattle, WA. Project Manager for the evaluation of alternate alignments and final tunnel design for the Henderson CSO. The 2-mile-long alignment included up to seven variations in percentage of tunnel vs. trench, location of pumping and treatment facilities, and variations in alignment. Assisted CM Team in reviewing submittals, assessing construction methods, and analyzing ground behavior of seven access shafts to a 16-foot-diameter, 3,500-foot-long storage tunnel excavated with an earth pressure balance machine, five microtunnels ranging from 48- to 78-inch-diameter and up to 750 feet long, and six horizontal directional drill holes beneath Interstate 5 and mainline UPRR and BNSF railroad tracks.

Baumgartner Sewer Tunnel and Drop Shafts, St. Louis, MO. Staff Tunnel Consultant to review the designer's 90 % bid documents and provide a constructability review for the Construction Management team and owner for 20,000 feet of 8-ft diameter sewer tunnel and six 100 to 150 ft deep drop shafts and a 50 ft diameter pump station shaft constructed through limestone, interbedded with shale, dolomite and chert layers. During initial construction it was found that solutioning along selected joints and bedding planes resulted in localized zones of potentially high groundwater inflow. The CM team coordinated with the contractor to perform additional explorations and a remedial grouting program to successfully grout these rock features to preclude excessive leakage into the advancing tunnel and shafts.

R. Travis Deane, PE, GE | Senior Associate

EDUCATION

MS, Geotechnical Engineering, University of California, Berkeley, California, 1998
BS, Civil Engineering, University of the Pacific, Stockton, California, 1992

REGISTRATION

Civil Engineer: WA, 37159, 2000
Civil Engineer: CA, C55469, 1996
Geotechnical Engineer: CA: GE2544, 2001

PROFESSIONAL SUMMARY

Travis has provided geotechnical engineering services in Northern and Southern California, the Pacific Northwest, and the Great Plains since 1992. Travis' experience includes geotechnical feasibility, environmental support, preliminary and final design, and construction monitoring for infrastructure and building projects. Infrastructure projects for private and public agencies include new alignments for railroads and roadways and rehabilitation/expansion of existing alignments. Project delivery methods on Travis' projects include design-bid-build and design-build. His work includes identification and recommendations for mitigation of geologic hazards (e.g., liquefaction, landslides, and soft soils), bridge foundations (shallow, driven piles, and drilled shafts), retaining walls (e.g., gravity, cantilever, soldier pile, soil nail, and MSE), and earthwork (excavations, embankments, and subgrade). Travis has extensive earthquake engineering experience, including site-specific response analyses, slope stability analyses, liquefaction analyses, and retrofitting and mitigation evaluations. Travis has completed building design and construction services for commercial and residential developments, educational, military, industrial and municipal facilities. In addition, he has completed forensic studies on distressed structures including bridge, embankment/levee, slope, and wall failures. Travis has also completed support for environmental studies, preliminary engineering, and third party reviews for proposed transit projects in the Seattle and Los Angeles metropolitan areas, including evaluating various tunneling methods.

RELEVANT EXPERIENCE

State Route 89, Mousehole Tunnel Replacement Project, Truckee, California. The Town of Truckee and Caltrans have been investigating widening SR-89 to accommodate increasing traffic flows. This segment of roadway includes an 80-year old, 25-foot wide double-lane tunnel, known as the "Mousehole," under a fill embankment supporting mainline Union Pacific Railroad tracks. Because of numerous constraints, we were directed to evaluate tunneling options that could be used to construct twin 40-foot-wide highway tunnels and a 12-foot-wide pedestrian tunnel without disrupting rail traffic. As project engineer, Travis helped prepare an assessment to evaluate tunneling options and worked on the selected final design with the project team. We completed a limited exploration program of the embankment consisting of both horizontal and vertical drilling. We evaluated four options for the highway tunnel replacement, and based on the information collection and project constraints, recommended the sequential excavation method (SEM or also known as the New Austrian Tunneling Method) be considered for two new tunnels and a pipe jacking method for the new multi-use pedestrian tunnel. The final design consisted of pipe jacking in combination with ground freezing to support the tunnel excavation.

Union Pacific Railroad, Los Angeles Transportation Center (LATC), Los Angeles Subdivision, Los Angeles, CA. (Ongoing as of February 2011) Travis is project manager and lead geotechnical engineer for reconfiguration of the intermodal yard adjacent to downtown Los Angeles. New container and chassis stalls and working and tracks will be constructed in the yard. A new maintenance shop, roadability, and flip yards are also proposed. The LATC yard will also be expanded to the south and a 30-foot high retaining wall is proposed along Mission Road. The retaining wall is designed to be soldier pile with tieback anchors or soil nail walls. Geologic hazards typical of the Los Angeles basin that we identified included seismic hazards such as liquefaction and lateral spreading, subsidence, expansive and corrosive soil, oil wells, and methane gas. Our design recommendations included mitigation measures such as ground improvements or deep foundations for the new structures.

Alaskan Way Viaduct & Seawall Replacement, Seattle, WA. Travis assisted in preparation of the Environmental Impact Statement (EIS) for the replacement of a 2.5-mile long section of SR-99 and the adjacent existing seawall located along Seattle's waterfront. The area faces an urgent need to retrofit, rebuild, or replace the Viaduct and the Seawall because of their age, risk to public safety, seismic vulnerability, deteriorated condition, and critical role in the region's transportation system. Travis assisted in the geotechnical engineering recommendations for the Viaduct replacement alternatives, earthquake engineering studies to evaluate the liquefaction and lateral spreading potential of the soils along the alignment, construction dewatering studies, and evaluating potential impacts from contaminated properties along the alignment. Travis also worked on design of the portal and ventilation structures for the tunnel alternative selected for final design of the project.

Mulholland Highway Washout, Hollywood, California

Travis was lead geotechnical engineer and designer of an emergency repair for a washed out roadway below the "Hollywood" sign. This section of Mulholland Highway was closed to general traffic given the steep slopes and narrow width, but was used by the City to access communication towers on top of Mount Lee. The Los Angeles Bureau of Engineering requested we work with Griffith Company (contractor) to develop a "design-build" repair and begin construction within two days after the initial site meeting to review the washout. Travis worked with the City and contractor to review four repair options and explored the washout with the contractor's equipment to determine the most feasible repair option. This repair consisted of excavating into the existing rock cut of the roadway and using the material to fill the washout and buttress the fill side of the road. The road was passable within two weeks and reopened entirely within two months.

Off-Cycle Crew Support Building, United States Coast Guard, Alameda, California

Travis was lead geotechnical engineer and project manager for the TetraTech/Tesoro design-build team for this new building project. The building footprint is approximately 17,700 square feet and is a steel-framed two-story building with an interior concrete slab-on-grade lower floor. The site is fill over San Francisco Bay Mud susceptible to liquefaction and ground settlement from consolidation. The D-B Team selected a deep foundation system consisting of auger-cast in-place piles (ACIPs) with a structural mat slab to support the new building. We observed the installation of the ACIPs, utility backfill, and other minor grading components of the project.

U.S. Forest Service, South Fork Snoqualmie River Bridge, King County, WA. Travis provided geotechnical engineering recommendations and construction observation for replacement of an existing steel truss bridge crossing the South Fork of the Snoqualmie River about 10 miles west of Snoqualmie Pass. The project was developed as design-build project and Shannon & Wilson staff attended several meetings with the USFS, contractor and design team to develop a suitable foundation system for the new bridge. The east abutment is supported on steel pile driven through cobbles and boulders deposited during periods of high runoff from the river. The west abutment was located on bedrock slope. A shallow foundation system with rock bolts was planned for the proposed abutment and wingwall. We observed the pile installation to confirm subsurface conditions were as anticipated and tested the abutment wall backfill. The project was fast-tracked to be completed during the short summer months due to high snowfall.

Dakota, Minnesota & Eastern Railroad, New Track, WY and SD. Project Manager for about 262 miles of new railroad starting from existing tracks east of Rapid City, skirting the south end of the Black Hills, and into the coal fields of the Powder River Basin in east-central Wyoming. Proposed alignment crossed a variety of terrain including landslides, expansive soil, collapsible soil, and mine spoils. To expedite project construction, divided the alignment into geotechnical segments to prioritize our work based on geology, topography, and/or access conditions. Initial field program included geologic mapping and over 150 field exploration sites. Remote locations, environmental concerns, and property requirements necessitated a variety of drilling equipment be used for the field explorations, including all-terrain vehicles and helicopters. Due to property concerns and remoteness of area, we used GPS equipment to locate proposed exploration sites and track features. We prepared project deliverables for the owner including a geotechnical data, characterization, and baseline reports for prospective Design-Build teams pursuing the project.

El Segundo Business Park, Central Park Infiltration, El Segundo, CA. As project manager, prepared the infiltration parameters for design of a dry well system to collect and infiltrate runoff from the business park. Prepared a design report summarizing our findings and recommending the dry well system through the existing, clayey fill and into the underlying native dune sand. During construction of the dry wells, reviewed construction field reports for the dry well installation and associated grading. Also prepared construction reports for agency approvals.

Union Pacific Railroad, East Los Angeles Intermodal Yard, Los Angeles, CA

The East LA Yard is one of a dozen intermodal and automotive yards on the UPRR system that Travis is project manager for to review yard distress and provide repair recommendations. This yard has localized areas of pavement distress and is also looking to redevelop the eastern part of the yard with new pavement sections. We have identified areas of distress at the yard and are planning to do a combination of cores through the pavement sections and soil borings in the proposed redevelopment area. We provided pavement design recommendations to repair and/or replaced the pavement distressed areas.

Dean G. Francuch | Associate Geologist

EDUCATION

BS, Geology, California State University, Northridge, California, 1987
Post-Graduate Work, California State University, Los Angeles, California

REGISTRATION

Professional Geologist (P.G.), No.5789, State of California, 1993
Certified Engineering Geologist (C.E.G.), No.1842, State of California, 1993

PROFESSIONAL SUMMARY

Over the past 23 years, Mr. Francuch has been actively involved from the "ground up", conducting and managing projects involving geotechnical engineering and engineering geology for engineered facilities (landfills, mines, transportation and pipelines) and residential developments. His experience includes working on both private and public funded projects from small single-lot homes to 2000-acre master-planned developments. For many of those projects Mr. Francuch planned and implemented geologic and geotechnical investigations to characterize soil and rock conditions at the sites. He has conducted numerous geotechnical investigations to recognize active faults, landslides and other geologic hazards. Mr. Francuch's professional experience spans the State of California from the southern border to the Bay Area, and includes work within the States of Nevada and Arizona. He has been actively involved in field studies during his career, having conducted extensive geologic mapping projects throughout southern California within various geologic terrains. He has been intimately involved in drilling projects for landfills, large-scale real estate developments, and mining operations. He also has a significant amount of experience with groundwater well installation having worked on groundwater studies for landfills and industrial facilities, gaining valuable knowledge of various drilling techniques and practical well construction methods. Besides his professional geologic background, Mr. Francuch has an extensive knowledge of freight and passenger railroad operations and holds a Class 1 Certified Locomotive Engineer license.

RELEVANT PROJECT EXPERIENCE

Residential Development

Anaverde Development, Empire Land, LLC, Palmdale, California. Senior Engineering Geologist for 2000-acre residential, commercial and recreational master-planned community, including school sites, fire station, multi-lane roads and bridges. Managed geotechnical investigations including active-fault delineation of San Andreas Fault Zone splays, elevated groundwater and liquefaction mitigation, and bedrock slope stability analyses. Project developed over multi-year phased construction.

Alta Vista, Newhall Land, Santa Clarita, California. Senior Engineering Geologist for mass grading construction. Managed geotechnical construction aspects of 83-acre mixed residential development including fill compaction. Geologic hazards included active faults and daylighted slope conditions. Recognized potentially unstable slopes and co-designed buttress remediation. Supervision of soil technicians.

Showcase Homes, Santa Clarita, California. Project Geologist for slope stability and active fault study of 82-acre, 161-lot residential development. Performed subsurface investigation using bucket-auger drilling and trackhoe methods to define active zone of San Gabriel fault.

Foothill Church Assembly Hall, San Dimas, California. Performed field investigation for proposed 300-person Assembly Hall located adjacent to mapped trace of San Antonio fault. Work included fault trenching across site in Pleistocene-age alluvium. Responsible for delineating and identifying activity along faults within proposed expansion.

Landfills

Chiquita Canyon Landfill, Republic Services, Valencia, California. Senior Engineering Geologist for Geologic Hazards and Slope Stability Study. Managed and performed field investigation for proposed 60-acre landfill expansion. Work included fault trenching and landslide exploration using bucket-auger drilling techniques in Plio-Pleistocene sedimentary rock. Responsible for delineating and identifying activity along mapped regional faults within proposed expansion. Professional services and construction completed in 2006.

Barstow Landfill, Norcal/County of San Bernardino, San Bernardino County, California. Engineering Geologist for Geologic Hazards Study: Geologic mapping of Quaternary and Tertiary sedimentary deposits for proposed landfill expansion. Delineation of active fault zone using detailed Quaternary field surficial mapping methods, including desert pavement development and aerial photo-interpretation. Final report preparation for submittal to state oversight agency.

Landers Landfill, Norcal/County of San Bernardino, San Bernardino County, California. Senior Engineering Geologist for active fault study. Determined Holocene activity of previously unstudied fault, using mapping, trenching and soil stratigraphy techniques within Quaternary sediments and underlying Mesozoic granitics and Precambrian gneiss.

Imperial Landfill, Imperial County, California. Engineering Geologist for Imperial fault study. Fault trenching across 1944 and 1977 fault breaks through Pleistocene lake deposits for proposed landfill expansion. Use of aerial photographs as well as offset cattle feedlot "deposits" to determine location of break.

Edom Hill Landfill, County of Riverside Waste Management Department, Riverside County, California. Engineering Geologist for Evaluation Monitoring Program. Installation of deep sedimentary bedrock monitoring wells (up to 400 feet) using mud rotary method and geophysical logging. Geologic mapping and trenching to identify structure adjacent to the San Andreas fault for groundwater modeling within Pleistocene sedimentary deposits. Final analysis was presented to the Riverside County Board of Supervisors for EIR approval.

Tajiguas Landfill, County of Santa Barbara, Santa Barbara County, California. Project Geologist for active fault study. Fault trenching within recent alluvial deposits to delineation and potential setback for proposed expansion. Use of carbon dating techniques to determine offset date.

Slope Stability Study, San Timoteo Landfill, County of San Bernardino, Redlands, San Bernardino County, California. Project Engineering Geologist for subsurface investigation of slope stability study for proposed landfill expansion using bucket-auger drilling techniques within Plio-Pleistocene sedimentary bedrock. Expansion design included slopes as high as 225 within faulted and landslide-prone bedrock. Study included computer stereonet analysis of proposed design and final recommendations regarding slope design relative to geologic constraints. Construction management included overview of geologic mapping program to verify anticipated field conditions.

Golden Valley High School and Golden Valley Road, Phase 1, City of Santa Clarita, Santa Clarita, California. Senior Engineering Geologist for geotechnical investigation. Managed and performed investigation of 160-acre school site and associated 6-lane road. Investigation included fault trenching, landslide delineation and geologic mapping of Plio-Pleistocene sedimentary units.

Co-developed plan to mitigate landslide below critical satellite facility. Four volume report required fast track schedule to meet state funding requirements. Professional services and construction completed in 2002.

Roadways and Transportation

Golden Valley Road, Phase I, City of Santa Clarita, Santa Clarita, California. Senior Engineering Geologist for mass grading construction. Managed geotechnical construction aspects of 8 million yd³, 160-acre school site and 1.2 mile 6-lane roadway. Included extensive mitigation of over 50 landslides and active fault zone delineation. On-site utilities required relocation or protection including four high-tension lines, twin 30-inch gas mains, four oil wells, and 6-foot diameter aqueduct. Supervision of a staff of field technicians and geologists. Numerous public presentations were given to the Santa Clarita City Council and W.S. Hart school board.

Copperhill Drive, Valencia Company, Valencia, California. Senior Engineering Geologist for mass grading construction. Managed geotechnical construction aspects of 4.5 million yd³, 500-acre site and 2.2 mile 4-lane roadway. Work included fault mapping, landslide remediation and protection of high-tension lines, groundwater monitoring wells and water distribution line. Supervision of a staff of field geologists and soil technicians.

Commercial and Light Industrial

Gates Development, Newhall, California. Project Geologist for Geologic Hazards Study. Detailed geologic mapping of 450 acres including delineation of potentially active fault for a light industrial development and park site. Major utility corridor including railroad, metropolitan water aqueduct and gas mains feeding the City of Los Angeles.

APPENDIX B
DR. ROY SHLEMON'S REPORT

APPENDIX B

DR. ROY SHLEMON'S REPORT

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FIGURES

Independent Assessment of Fault-Activity Reports, Westside Subway Extension
Project: Potential Technical Impacts on the City of Beverly Hills

Summary Of Reconnaissance Field Observations, Fault-Trench Exposures FT-1
through FT-3 (1 February 2012) and FT-4 (13 February 2012), Beverly Hills High
School (BHHS), Beverly Hills, California

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6 November 2011

Mr. R. Travis Deane, P.E., G.E.
c/o Shannon & Wilson, Inc.
664 West Broadway
Glendale, CA 91204

Re: Independent Assessment of Fault-Activity Reports, Westside Subway Extension Project: Potential Technical Impacts on the City of Beverly Hills

Dear Mr. Deane:

As requested, I have reviewed the several fault-activity documents and voluminous appendices prepared by consultants and reviewers in support of the proposed Westside Subway Extension Project. I have particularly focused on the adequacy of these investigations, the technical reasonableness of the conclusions and the potential impact on the City of Beverly Hills by the proposed alternative tunnels and transit stations and by the multiplicity of "active" fault now identified. Additionally, I responded to fault-related, City-raised questions about:

(A) The feasibility an alternative alignment beside that proposed for the Santa Monica and Constellation stations;

(B) The siting of the Santa Monica station along Santa Monica Boulevard between the Santa Monica Fault Zone (SMFZ) and the West Beverly Hills Lineament (WBHL) as presently depicted on the technical report maps;

(C) The potential that one or more so-called active faults could impact location of the Constellation station; and

(D) The precedent for locating a station across a known, regulatory-defined active fault.

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The general mapped locations of the consultants' fault zones, whether previously documented or now inferred, ostensibly components of the Santa Monica thrust system (SMFZ), the Newport-Inglewood fault zone (NIFZ), and the so-called West Beverly Hills Lineament (WBHL), are documented on Shannon & Wilson Figure 1. This figure is thus referred to, but not replicated in this report.

My fundamental conclusions and pertinent recommendations were previously discussed and presented to your staff and geotechnical consultants in various electronic communications and conference calls, but are here summarized for more specific documentation.

1. The consultants' technical reports, particularly those investigating the possible presence and relative activity of faults potentially impacting proposed alternative tunnels and transit stations, meet the current professional standard-of-practice. However, uncertainties are inherent in all geological investigations; and professional judgment is therefore always appropriate. By virtue of the investigative techniques employed, and the consultants' expertise and professional standing, I judge that the fundamental conclusions are reasonable, though in some areas, as indicated in following sections, probably too conservative.

2. There are indeed alternative alignments that, from a technical standpoint, may be preferable to those serving the proposed Santa Monica and Constellation stations. But many factors are involved, including technical costs, impact on existing infrastructure and related cultural and economic issues. Any alternative inherently requires site-specific technical investigations, including those to more accurately delimit fault location and to determine relative activity.

3. The technical virtues of relocating the proposed Santa Monica station between the map-depicted (Fig. 1) traces of the SMFZ and the WBHL are very low. In fact, more previously unrecognized faults are likely to be encountered, particularly offsets in the upper plate of the Santa Monica thrust system. Accordingly, an appropriate investigation would likely be costly and time-consuming. Better alternatives are available.

4. Given the regional tectonic framework, there is reasonable probability that a heretofore unrecognized fault does pass through or could affect the proposed Constellation station. Based on existing maps, no obvious faults are recognized, but site-specific investigations are definitely warranted. These would likely include advancement of closely spaced cone penetrometer test lines.

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Of geologic concern here is that the NIFZ appears to be “branching” and hence one or more splays may affect the exact site for the proposed station. But the fault investigations are doable, and likely to produce good data for technical decision making.

5. Since enactment of the Alquist-Priolo Act in 1972, no habitable structure has been knowingly placed on a California-defined active fault. The deterministic number traditionally used is about 11,500 years; that is, if there has been ground rupture within that time, then the fault is deemed active, regardless of the amount or recurrence of movement. Accordingly, at present, no structural design or mitigation, other than an appropriate-distance “setback,” is permitted for siting a station, here most likely deemed a “habitable structure” by State regulations.

6. The consultants’ technical reports now portray the WBHL to be an approximately 600-ft wide zone of faulting. This is not based on direct field observation via trenching and logging, but rather indirectly, based mainly on interpretation of seismic and cone penetrometer test (CPT) data. The conclusions indicate that late Pleistocene strata are likely displaced and, although not physically documented, the myriad of fault comprising this zone are judged to be “active” (Holocene) based on inferred extension of the Newport-Inglewood fault zone with its demonstrably historic movement. The inherently conservative interpretation has many implications for the City of Beverly Hills:

A. The proposed Santa Monica Boulevard (east) station would lie amid these faults, and thus require intensive subsurface investigation to demonstrate that it *would not* be located above a fault;

B. The WBHL faults are branching out to the north as they project into the east-west-trending Santa Monica fault zone. Thus, comparable to the myriad of splays that are now found within a redevelopment area in downtown San Diego (Rose Canyon fault system), some faults may be demonstrably active, whereas other probably had last surface rupture in the late Pleistocene. In essence, regional strain partitioning within the WBHL gives rise to faults with long and “erratic” recurrence. Hence some faults are active according to California regulatory interpretation. Others, however, may not be so. Only laborious, expensive and time-consuming subsurface investigations will likely differentiate between the two; and even then high uncertainty will remain. Accordingly, the probability of diverse, and potentially argumentative, scientific interpretations would be high.

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C. The WBHL faults are not presently placed into an “earthquake hazard zone” by the California Geological Survey (CGS). But, given the conclusions of the technical reports and reviewers acceptance thereof, this will likely soon happen. Accordingly, site-specific investigations will be required to demonstrate a fault’s relative activity and to establish an appropriate set-back distance.

D. Though probably an unintended consequence, the consultants’ designation of faults within the WBHL as active will ultimately negatively impact many commercial and residential structures with the City of Beverly Hills. Specifically, all existing critical (essential) facilities will be affected. This means that construction, expansion or other changes to police and fire stations, to schools, to major water and gas storage facilities, and to all infrastructure will require fault-activity assessments. Further, many property owners will find themselves in a newly designated active fault zone, potentially affecting value and perceived risk from potential ground rupture.

7. The Santa Monica fault zone poses another challenge. According to the consultants’ technical reports and acceptance by the reviewers, there are likely to be several thrust (reverse) fault associated with the zone. Other faults with similar characteristics in the Transverse Ranges are typified by upper-plate back thrusts not yet identified given the level of investigations presently carried out in the City of Beverly Hills and adjacent areas. These offsets, however, may be small, but many are likely to be “active.” Because current regulatory interpretations fail to allow engineering mitigation, even for offset less than a few inches, the only permissible option is to set-back from the presumed causative fault. But how much setback is appropriate is highly debatable. And, given the urban setting, trenching and other direct geological observation of faults is not likely; and thus only CPT and seismic investigations reasonably offer hope of fault-setback resolution, and even then uncertainty will abound.

8. The “junction” of the SMFZ and the WBHL faults remains uncertain. The boundary, as depicted on Figure 1, is likely to be one or more so-called tear faults. But the tectonic framework here is very complex, and hence subject to a wide variety of academic interpretation. Siting of tunnels and surface stations in this area will thus inherently require extensive and expensive investigation.

9. Owing to the multiplicity of faults and structural complexity in Beverly Hills, including those of the Newport-Inglewood fault zone that give rise to the original “high topography” of the area and the associated hydrocarbon, stratigraphic

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traps, inherently required are site-specific investigations to determine fault presence and relative activity. Such studies are obligatory to meet current regulations, to allow engineering design for seismically induced ground accelerations, and ultimately to ensure general public health and safety.



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**SUMMARY OF RECONNAISSANCE FIELD OBSERVATIONS,
FAULT-TRENCH EXPOSURES FT-1 THROUGH FT-3 (1
FEBRUARY 2012) AND FT-4 (13 FEBRUARY 2012), BEVERLY
HILLS HIGH SCHOOL (BHHS), BEVERLY HILLS, CALIFORNIA**

BACKGROUND

As requested by Shannon & Wilson (S&W), on behalf of the City of Beverly Hills, this document summarizes my field observations on 1 February 2012 of the initial three fault trenches, and on 13 February 2012 of an additional “gap” trench on the Beverly Hills High School (BHHS) campus. The four trenches were excavated and logged by Leighton & Associates (L&A), Consultants-of-Record for the BHHS.

For chronology: I was formally invited by an L&A Principal Geologist (Phillip Bucharelli) on 24 January to personally visit the site on 1 February 2012 at which time it was understood that I would meet the L&A field geologist (Joseph Roe) and his associate geologists. This was followed by several e-mail and telephone conversations with various L&A personnel regarding exact date, time and place for the observations. Following the initial invitation, I notified S&W, who formally authorized me to undertake the observations and ultimately provide the points following, initially orally, and now in expository form. Also summarized are the observations of 13 February about the likely age of sediments and soils (pedogenic) newly exposed in L&A Trench FT-4.

When arriving at the site on 1 February 2012 (241 S. Moreno Drive, Beverly Hills, CA 90212), I met the following, and to my best recollection provide their names, in whole or part, and their respective affiliations:

| Tim ~~Baresh~~ Buresh BHHS representative and coordinator of the project.

Joe Roe L&A Senior Geologist and “field chief” and four of his associates who were logging the then-opened trenches.

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Glenn Borchardt	L&A consultant from northern California, who was retained to document trench-exposed soil (pedogenic profiles) after my potential “conflict of interest” working with S&W precluded retention by the BHHS district.
Miles Kenney	Geologic consultant to an attorney retained by outside counsel for the BHHS.
Kathryn Hanson	Geologist for the U.S. Geological Survey, UC Riverside office.
“unknown geologist”	A lady paleoseismologist from the USGS office in Pasadena, presently studying the San Andreas fault system in southern California. She is apparently a former academic, recently employed by the USGS. We were introduced, but – unfortunately – I do not recollect her name.
Janis Hernandez	Geologist for the California Geological Survey (CGS; LA office). Janis works mainly with the with the Jerry Treiman, the Senior CGS geologist in southern California, who reviews all fault investigations where California-defined “active faults” may be present and thus potentially “zoned” for possible inclusion into an “Alquist-Priollo fault hazards zone.” Jerry was not present, apparently owing to an illness.
Brian Olson	Another CGS geologist working out of the Sacramento office.
Tim ???	Yet another CGS geologist, who apparently specializes in neotectonics.
Eldon Gath	Principal of Earth Consultants International (ECI), retained by the BHHS (?) or by counsel for the District. A co-owner of ECI is Thomas Rockwell from San Diego State University and a member of the Southern California Earthquake Center (SCEC). Tom is one of several academic reviewers who

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commented on faults portrayed in reports of the
“Westside Subway Extension Project (WSE).”

Not present during the 1 February 2012 trench observations were other geology and engineering consultants from “Exponent,” a forensic firm formerly known as “Failure Analysis,” apparently retained by the City of Beverly Hills.

TRENCH OBSERVATIONS AND INITIAL INTERPRETATIONS

As of 1 February 2012, L&A had opened, shored and was in the processes of logging three, on-campus trenches, identified as fault-trenches FT-1, FT-2 and FT-3, respectively. L&A kindly provided me with draft logs. The three trenches were oriented east-west, sited to cross an escarpment that comprises the surface expression of the West Beverly Hills Lineament (WBHL), presumed in the WSE technical reports to be a north-south extension of the Newport-Inglewood fault zone (NIFZ).

In brief, FT-1 some 110-ft long and ~15-ft deep was placed on the crest of the low, north-south-trending hills that mark the campus. The trench was hydraulically shored as appropriate. L&A collected several organic samples for radiocarbon assay. Some near-surface samples were bulk, obtained from organic matter (modern A-horizon); deeper samples were apparently charcoal fragments or even wood according to the L&A field geologist. The dates, as provided by Beta Analytic (Miami, FL), ranged in age from ~1 ka (kilo-annum) near the surface to ~25 ka at the base. Candidly, I reject these numbers owing to the high potential for post-depositional contamination. First, the near-surface samples were bulk organic material and thus yield mean-residence-time ages with an inherent wide range of uncertainty. Further, these sediments are receiving irrigation water from adjacent grassy areas and thus highly susceptible to modern groundwater contamination.

Second, the lower samples, although in proper chronological order (deeper are older), are mainly in expandable clay with high water-holding capacity. Thus, as discussed previously with S&W, one percent of modern contamination yields a date of ~35 ka for a sample truly about 100 ka. Also, the lower-trench samples would also been subject to likely increased gravitational water flux during at least two or three previous epochs of regional pluviality during the Pleistocene.

Third, and an additional “defect” with the L&A radiocarbon chronology, is that the near-surface sediments (below the fill) are capped by an extremely strongly

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developed relict paleosol, one ~8-ft + thick with common to many reddish-brown (5YR 4/3-5/3 in Munsell notation) clay films that line ped faces and bridge mineral grains. Based on initial observations, I judge that this soil is at least ~200 ka old! The underlying sediments (parent material) are inherently older. Moreover, this high-surface landform is essentially uneroded, and hence geomorphically stable, thus allowing sufficient time and the vagaries of climatic change to form the strongly developed relict paleosol that caps the surface.

In summary, L&A identifies no faults in this trench, and I observed none as well. If any faults are ultimately identified in FT-1, they are most likely to be substantially pre-Holocene in age and hence “not active” according to present State of California definition.

L&A trench FT-3 was emplaced about 150 ft south of FT-1. This trench was similar in length and depth to FT-1. It, too, was emplaced on the crest of the hills that mark the BHHS campus, and likewise exposed a strongly developed, surface relict paleosol, an estimated ~200 ka old. L&A preliminary logs showed no faults in this trench, and none were observed during the 1 February 2012 reconnaissance.

L&A trench FT-2, the easternmost, was placed on relatively flat terrain immediately adjacent to the general north-south trending escarpment on the campus. FT-2 was 360-ft long, and locally up to ~20-ft deep. The trench walls were also supported by hydraulic shores. The sediments were essentially flat; no eastward “tilting” was apparent that might suggest late Pleistocene or Holocene neotectonic uplift. Unfortunately, however, there was an approximately 15- to 20-ft “gap” between the west end of FT-2 and the east ends of FT-1 and FT-3. This “critical” link extends up the escarpment, a geomorphic position most likely to reflect possible near-surface faults. On the day of the reconnaissance, L&A was attempting to close this gap by excavating FT-4 around water pipes, electrical conduit and other buried infrastructure. But the exposure was not yet cleaned, logged or otherwise ready for observation. Based on the FT-2 observations (below), the FT-4 exposures are critical for the BHHS fault investigations! If no faults are found and if the sediments are demonstrably pre-Holocene in age, then the likelihood of “active faults” affecting the campus is very low.

Based on my soil-stratigraphic reconnaissance (profiles were not yet formally measured, described or otherwise characterized in accordance with current standards of practice), I judge that the FT-2 sediments are substantially younger

than those exposed in FT-1. Possible incipient buried paleosols are present, but these are not strongly developed, owing to the lack of significant translocated

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clay films. The strong blocky to prismatic structure interpreted by some observers as indicative of soil age most likely stems from inherent expansion and contraction of primary clay minerals (probably smectites), rather than from pedogenic processes.

The L&A draft logs show “soil cracks” on the north wall near station 1+60. But I, and most other observers, identified clay-filled cracks with up to ~1-1/4-inch vertical displacement near the west end of the trench, essentially at the base of the north-south campus escarpment. There are about four or five of these slip surfaces, all with the downslope (east) side up. There is no obvious increase of displacement with depth. Also, whether or not the “cracks” continue to the base of the trench is yet unclear and awaits L&A continued logging and formal documentation. I suggested to L&A that they cut back into the trench wall and log two or possibly three additional faces at these critical localities, as well as log the south side of the trench. The intent is to determine possible horizontal displacement by using local fine-gravel stringers as piercing points and to ascertain the existence of horizontal slickensides, markers of potential right-lateral slip along the NIFZ. Tectonic slickensides, if present, should be readily visible, for the parent material has a field-estimated clay content of >50 percent.

Frankly, these apparent offsets, minor though they may be, are the heart of the issue. Alternative explanations for their origin are possible (e.g., regional, tectonically driven, downslope “lurching” or less likely soil expansion). I believe, however, that the School District consultants will have to provide overwhelming evidence that the vertical offsets are not tectonic in origin. This may require additional on-site and possible offsite-trenching and documentation. Further, based on “informal trench conversation,” I suspect that some of the invited agency regulators are ready (as of ~5:00 PM on 1 February 2012) to pronounce these offsets as Holocene (active) faults until proven otherwise.

In sum, based on reconnaissance of L&A fault trenches FT-1, FT-2 and FT-3, there are small, but discernible vertical displacement exposed in FT-2 that generally coincide with the strike of WBHL and WSE-presumed NIFZ splays and with the base of the campus escarpment. These vertical slip features may owe their origin to processes other than to neotectonics; but the offset sediments are not yet dated, and only L&A, and perhaps other invitees, have seen the critical exposures in FT-4.

On 12 February 2012 I was advised by S&W that L&A had completed excavating and logging the “gap” trench, FT-4; and that I was requested to communicate

with L&A personnel and to arrange field observations. Accordingly, on 13 February I met on-site with L&A (Edward Burrows, Joseph Roe and four other

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L&A “loggers”), and with Eldon Gath, Tania Gonzalez and three other geologists from Earth Consultants International (ECI). ECI is apparently retained by BHHS to provide “second-party” review and to otherwise independently document all trench exposures and render their opinion to the School District.

Of particular interest were the new trench, FT-4, ~110-ft long and about 15-ft in depth; and the east part of FT-3 where new sidewall cleaning exposed a heretofore unidentified fault.

FT-4 covers much of the escarpment “gap” between the west end of FT-2 and the east ends of FT-1 and FT-3. A draft log of FT-4 was not available but, from initial observations, there are no obvious faults present, and the soil-stratigraphic column is substantially older than Holocene. In fact, a minimum age for the FT-4 stratigraphy is >~35 ka. Upon departure from the site by ~5:00 PM, L&A personnel were just completing FT-4 logs, and informed me they, too, observed no offsets in the stratigraphy.

The fault exposed in the north wall of FT-3 was apparently previously missed owing to its exposure directly under near-surface ~16-inch diameter pipes. Final hand cleaning shows the fault to be essentially vertical with about 3-4 inches of displacement. Offset decreases slightly with depth suggesting that probably two near-surface tectonic events are recorded in the sediments. Based on the L&A logging, with apparent concurrence from ECI, the fault terminates at the base of fluvial gravels, which are imprinted with the regionally extensive, ~200 ka relict paleosol. Accordingly, last surface displacement of this FT-3 “minor” fault occurred well before about 200-ka years ago; and the fault is therefore not active accordingly to present State of California criteria.

Another gap of ~15-ft occurs in the western or uphill part of FT-2, owing to “cover” by two or more ~6-ft concrete pipes. However, viewing sediments exposed under the pipes, from both the uphill and downhill sides, suggests continuity of sediments. When FT-2 is finally filled, L&A will place a short parallel trench on the present spoil piles in order to confirm apparent lack of displacement. Accordingly to L&A, this task will be completed by about 21 February.

The several ~1 to 2-inch, near-surface offsets, previously logged in FT-2, are now shown to die out at depth. Further, following previous suggestions, L&A cut back “slices” into both trench walls ultimately showing no slickensides in the

clayey sediments that might be construed as indicative of faults. Combined, the two lines of evidence indicate that the FT-2 offsets are not tectonic in origin, but

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rather more likely owe their origin to downslope lurching. ECI apparently agrees with this interpretation.

Following the site observations of 1 and 13 February 2012, respectively, I summarize my provisional conclusions:

1. There are no Holocene (active) faults exposed in any of the four L&A trenches, FT-1 through FT-4.
2. Sediments in all trenches are substantially older than Holocene based on the presence of relatively datable buried and relict paleosols. The L&A radiocarbon dates, from near-surface bulk samples and from deeper single specimens (non-detrital), are likely contaminated by modern irrigation water and by deeper gravitational water during the late Pleistocene. The contamination by younger organic matter thus provides only very minimal dates for the enclosing sediments. A more reasonable stratigraphy is offered by the paleosols, indicators of regional landscape stability and long-term weathering processes.
3. None of the ~200 ka and younger sediments are visibly or otherwise deformed, indicating that a possibly underlying anticline or monocline is not undergoing active uplift.
4. The capping oldest sediments, particularly well exposed in FT-1 and FT-3, contain remnant channel deposits that generally strike (based on projections of trench-exposed thalweg and channel edges) obliquely to the escarpment (WBHL). This suggests that the escarpment owes its origin to lateral fluvial erosion, rather than to fault truncation, thus supporting the direct observations from the L&A trenches.
5. A reasonable scenario to explain the geomorphically “stable” sediments and their relict capping paleosol is that these are remnants of Pleistocene distal fans emanating from the Santa Monica Mountains to the north. Continued thrusting and tear faults of the Santa Monica fault system most likely isolated the BHHS capping sediments from their source. This reasonable working hypothesis well explains why there is no Holocene or even late Pleistocene faults exposed in the L&A trenches.

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A handwritten signature in black ink, appearing to read "Roy J. Shlemon". The signature is written in a cursive style with a large initial "R" and "S".

Roy J Shlemon, Ph.D.

21 February 2012