



Kay St. Peters, PG, CEG
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Ms. St. Peters' 24 years of experience principally involves the evaluation of geologic impacts on public works, small to large residential, and commercial projects. She has conducted and supervised all phases of geological and geotechnical investigations including background research, aerial photography interpretation, geologic mapping, exploratory drilling, soil sampling, data analysis, development of mitigation measures, report preparation, and project management. Her experience includes fault hazard studies for schools and residential developments, geologic analysis of large hillside developments, slope stabilization studies, evaluation of unstable foundation soils, landslide investigations and treatment, as well as natural hazard mapping. She has considerable experience on earthwork construction sites, in addition to working with property owners, developers, civil engineers, and public agencies. More recently, she has applied her construction experience to site feasibility and environmental impact studies, assisting design engineers and land planners in the early stages of project development. She has also acquired considerable geotechnical experience with redevelopment projects within southern California's active and abandoned oil fields.

EDUCATION

B.S. Geological Sciences, California State University, Fullerton 1984

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS

Professional Geologist: California PG 4762
Certified Engineering Geologist: California CEG 1477
40-Hour Hazardous Materials Certificate

PROFESSIONAL HISTORY

Sr. Project Geologist, Gaia Geosciences, Inc., California March 2007 - Present
Project Geologist, Earth Consultants International, Inc., California April 2000 - Present
Staff, Senior Staff, and Project Geologist, Leighton and Associates, Inc., California
March 1984 - April 2000

PROJECT EXPERIENCE

Geologist for portions of the Foothill South Transportation Corridor Extension (State Route 241), southern Orange County to northern San Diego County, California. This 16-mile much-needed, but controversial roadway will cross largely undeveloped hillside terrain between the city of Rancho Santa Margarita and the Camp Pendleton Marine Base. Construction of the roadway will require extensive grading, including stabilization of several landslides, and construction of numerous bridges. The project has been designed to avoid Native American sites and to bridge over major waterways, such as San Mateo Creek. Services provided to the roadway design consortium included geologic field mapping, analysis of aerial photographs and topographic maps, geologic analysis of extensive borehole data, review of pertinent consulting reports prepared for adjacent properties, development of remedial estimates, and assistance in report preparation.

Geologist/Project Manager for a 520-acre hillside development (residential lots plus water reservoirs) on the north flank of the Puente Hills in Los Angeles County, California. Studies for this project included geologic mapping, drilling, soil sampling, and analysis. From the early planning stages through grading and construction of the infrastructure, this project spanned a number of years. Geologic impacts on the project included active faults, complex geologic structure, cut slope stability, landslide stability and compressibility, settlement of deep fills, and ground water seepage. In addition, the portions of the project constructed adjacent to steep natural hillsides were analyzed for potential inundation from mudflow during heavy winter storms. Based on this analysis, mudflow protection structures, such as deflection walls, impact walls, and debris catchment basins were designed into the project.

Geological Reviewer, Brightwater wastewater treatment plant near Woodinville, Washington. Reviewed the potential seismic and geologic hazards to this plant and found that the treatment plant proposed by King County lies within the newly discovered Southern Whidbey Island fault zone, and we recommended trenching the footprints of all surface facilities prior to permitting. We also assisted the City of Woodinville in developing its response to the proposed plant, including preparing a GIS layer to their planning documents locating aeromagnetic and LiDAR lineaments in the City and its urban growth boundary. We have also assisted in upgrading local seismic ordinances.

Geologist/Project Consultant for a 600-acre retail/commercial/industrial complex in the City of Industry, California. Located in moderate to steep hillside terrain within the eastern Puente Hills, this project will require extensive grading to develop the large, relatively flat pads required for the proposed buildings. This will result in high perimeter slopes, deep cuts into the hills, and canyon fills well over 100 feet thick. Due to the complexly folded bedrock that underlies the hills, the presence of numerous landslides, and the thick deposits of alluvium filling the canyons, significant earthwork remediation will be needed to provide a stable foundation for the future buildings. Services provided for this project included analysis of historical aerial photographs, analysis of historical topographic maps, planning and implementing a field investigation that included geologic mapping, excavation of over 100 borings, 250 test pits, and 10 cone penetrometer tests, geologic analysis of the data, and preparation of the reports and maps. During the process we analyzed several design concepts, and provided input for design alterations that will reduce the severity of negative geologic impacts and take advantage of the positive aspects of the site.

Geologist/Project Manager for a new master-planned resort community at Tejon Ranch, Southern California. Encompassing about 60 square miles of land consisting of broad valleys to steep mountains, this proposed residential/resort community will be built out over the next 10 to 20 years. Only a small portion of the property will be developed, primarily as large estates, clustered homes, vineyards, a commercial center, and recreational facilities. The remainder of the site, which consists of oak-studded and forested mountains, as well as spring-fed wetlands, will be permanently preserved as open space for hiking, horseback riding, and ecological studies. This geologically diverse site is vulnerable to numerous hazards, including ground rupture from active faults, strong seismic shaking, liquefaction, small to large landslides, debris/mudflow, and thick deposits of compressible soils. In order to evaluate the original design concept, we undertook an extensive background review of published literature, along with a geomorphic analysis of the landforms using aerial photographs and landsat imagery. We then excavated numerous fault trenches to constrain the location of active

faulting in the hillside terrain. In the deep, wet, alluvial filled valley, where trenching was not feasible, Cone Penetrometer Test soundings, along with several hollow-stem borings were used to define structural setback zones from the active fault strands. Geological mapping was performed to identify other potential hazards, such as landsliding, and debris flows. The collected data were entered into a GIS program for analysis. This resulted in a geological constraints and opportunities map, which was used by the landowner and the design team to reduce the amount of mitigation needed by avoiding areas with severe geologic impacts, and utilizing those regions with minimal impacts for the majority of the development.

Geologist/author of Natural Hazard Technical Background Reports prepared for the updated Safety Elements of the General Plans for the southern California Cities of Moorpark, Fontana, Pasadena, Torrance, Palm Springs, Rancho Mirage, Banning, Rialto, Ontario, Hesperia, Apple Valley, and Newport Beach. These southern California cities face highly diverse natural conditions that pose hazards on many fronts, including the potential ground rupture on major mountain-building fault zones, strong seismic shaking, liquefaction, water shortages, slope instability, and wildfires, as well as infrequent but severe storm flooding. In addition to these issues, the coastal City of Newport Beach, with its heavily populated shoreline, is susceptible to tsunamis, storm surges, and rising sea level. As populations in southern California continue to rise, cities face enormous and complex challenges in permitting development and redevelopment so that these projects proceed in a safe and environmentally responsible way, and in coordinating infrastructure improvements with state and federal agencies, as well as their neighboring cities. The technical reports prepared for these cities include a discussion of the unique characteristics of each city, GIS-based hazard maps and overlays, earthquake loss estimations for several earthquake scenarios, and mitigation strategies that can be used for hazard reduction.

Geologist/Project Manager during planning and entitlements for the 500-acre Tonner Hills residential development in the Brea-Olinda Oil Field, Orange County, California. Tonner Hills is a new master-planned community that will be constructed on the south flank of the Puente Hills, at the northeastern edge of the Los Angeles basin. Many of the oil wells are scheduled for abandonment, however oil and gas production in this 100+ year-old field will continue with new oil field infrastructure incorporated into the design and construction of the project. The site encompasses gentle to steep hillsides, and many of the natural slopes have been modified by past oil-field activities. In addition to slope stability issues, the active Whittier fault passes through the northeast corner of the site. Major canyons are filled with thick deposits of compressible soils. The site also contains active oil and gas seeps at the surface. Services provided for this project included review of subsurface oil field data, as well as previous geotechnical and environmental work performed on the site; fault trenching to evaluate the activity of secondary faults running through the development area; drilling, logging, and sampling of numerous boreholes to evaluate slope stability and the extent of hydrocarbon-bearing rock units within the proposed development area; preparation of the geological and methane sections of the Environmental Impact Report; and attendance at public hearings.

Geologic Reviewer for the City of Diamond Bar, California. The City of Diamond Bar, located in eastern Los Angeles County, encompasses varied terrain ranging from flatland to moderately steep hillsides. Consequently, a wide range of geologic conditions impact projects within the city including landslides, slope instability, compressible soils, liquefaction, and expansive soils.

Development projects typically included commercial sites, schools, parks, single-family homesites on large parcels, and small to large mass-graded residential tracts. Review services provided to the city included:

- Developed guidelines for preparation and review of geotechnical reports
- Reviewed geotechnical reports submitted to the city (preliminary, tentative tract, grading plan review, as-graded reports, and environmental impact reports)
- Reviewed project grading plans and notes for conformance with geotechnical recommendations
- Performed field observation during grading, followed by progress reports to the city
- Attended public hearings
- Met with members of the building and safety department
- Met with project applicants and/or their geotechnical consultants
- Provided geotechnical input for City of Diamond Bar projects

Geologist/Project Manager for a multi-unit residential development on Signal Hill, California.

Signal Hill is situated within the Newport-Inglewood Fault Zone, a major seismic hazard in the Los Angeles basin. It has also been a small, but highly productive oil field since 1923. In addition to homes, the project included new streets, infrastructure, parks, hiking trails, water reservoirs, and new oil drilling sites. Numerous geologic and environmental issues, in addition to the complex logistics of working in an active oil field, provided an interesting challenge for the design and construction team. The most significant issues included fault hazards, potentially unstable slopes, densification of compressible soils, treatment of contaminated soils, and performing exploratory and excavations in an area laced with a highly concentrated network of underground piping and structures. The interdependent nature of these issues required close communication among the developer, project team members, contractors, oil field operator, and regulatory agencies.

Geologist/Project Manager for the 280-acre Olinda Ranch Project in the City of Brea, California.

Located in moderately to gently sloping hillside terrain, this project included 660 new homes, a historic preservation site, community park, and trail corridors. The project is sited within the Brea-Olinda Oil Field, which is one of the oldest oil fields in California. Oil field facilities, including selected wells, tank farm, and infrastructure, will remain in operation and have been incorporated into the design of the community. The development area lies adjacent to the main trace of the active Whittier fault and encompasses several inactive, subsidiary faults. Over 50 excavations were mapped, logged, and evaluated in order to precisely locate the most active strands of this broad fault zone, both prior to and during grading. Based on these excavation specific setback limits for the homes were defined. This site was particularly challenging to the design and earthwork construction teams because of the presence of methane gas and naturally occurring oil seeps, as well as the abundance of underground pipelines and other structures. Planning, investigation, and analysis of the site required a strong, cooperative relationship with regulatory agencies, the developer, the civil engineer, and the oil field operator.

Geologist/Project Manager for the widening of Carbon Canyon Road (State Route 142), in the City of Brea and County of Orange, California.

A two-mile segment of Carbon Canyon Road was widened from two lanes to four lanes where this highway leaves the populated area of Brea and enters the Chino Hills. Cut slopes up to 100-feet high in natural hillsides underlain locally by hard, cemented sandstone were necessary in order to accommodate the eastbound lanes. Due to the shallow design cuts proposed for natural slopes modified by operations in the

adjacent oil fields, remedial grading for slope stabilization was needed along part of the route. The construction phase of the widening was also made difficult by the presence of numerous active and inactive oil field and municipal pipelines, as well as oil field sumps dating back more than 80 years. Services for this project included drilling, mapping, slope stability analyses, and recommendations for construction, following by detailed mapping during grading operations, and preparation of the final as-built report.

Geologist/Project Manager, fault investigation and seismic analysis for Crafton Hills College expansion, Crafton Hills, Yucaipa, California. Crafton Hills College is located within one of the most seismically active and geologically complex areas of southern California. Both the San Andreas and San Jacinto fault zones, located just a few miles on either side of the college, are expected to generate severe seismic shaking in the area within the next few decades. Smaller active faults, secondary to the two major fault systems, bound the Crafton Hills and are also capable of generating strong ground shaking. One of these faults passes through a portion of the college property. When the college decided to expand, we were asked to investigate several "suspected" fault traces that were shown on published regional maps. As a result, the absence of active faulting in the desired building areas was confirmed by trenching, and the college is moving ahead with their development plans. In addition to "clearing" the sites for their future buildings, we performed an analysis of strong ground motion that may be expected at the site.

Geologist/Project Manager for several residential developments within the former West Coyote Oil Field, a 700-acre hillside area that spans portions of the cities of La Habra, La Mirada, and Fullerton, California. This extensive project included single-family and multi-family housing units, an 18-hole golf course, equestrian center, water reservoirs, commercial areas and park sites, as well as the preservation of several canyons containing coastal sage habitat and several endangered species. Services included several phases of field investigation in order to provide land planners and design engineers with recommendations for creating grading designs that would utilize favorable geologic aspects of the site while planning nonstructural development for the problematic areas. The most significant impacts to the project were potentially active faults, numerous landslides, potential instability in planned cut slopes, and thick deposits of compressible soils. These issues were evaluated with over 150 exploratory trenches and borings that allowed characterization of fault patterns and of the three-dimensional geometry of the landslides. From this analysis, we developed a geologic structural model of the hills, analyzed the risk of ground rupture and slope failure, and provided recommendations for design and construction that would not impact habitat areas.

Geologist/Project Manager for a geological and geotechnical feasibility study, Montebello Hills Oil Field, City of Montebello, California. The Montebello Hills Oil Field is situated on one of the actively growing anticlines in the northern Los Angeles basin, and the rounded, chaparral-covered hills with deeply incised canyons have been extensively altered over the years by oil production activities. The design concept for the site indicated extensive grading would be required for development as single and multifamily homes, senior housing, a school, a park site, two reservoirs and commercial areas. For the investigation, an aerial photo analysis was performed, in addition to a literature review, detailed geologic mapping, exploratory drilling, and laboratory testing in order to identify any geologic "fatal flaws" or constraints to planning and design of the project. The geology and soil engineering characteristics of the site were then summarized in a report suitable for future use in the environmental impact report for the project. The principal geotechnical issues included natural and graded slope stability, seismic hazards,

and compressible soils.

Geologist/Project Manager for Fullerton Road/Harbor Road extension through the Puente Hills, Los Angeles County, California. Construction of this roadway created a new four-lane passage through the crest of the Puente Hills, replacing an old, narrow, circuitous country road. Crossing a large landslide and an active fault were impacts that required extensive geologic mapping, drilling, and analysis during the design phase to locate active strands of the Whittier fault zone, and to design remedial grading measures for stabilizing the landslide. This was followed by detailed mapping and analysis of the geologic conditions exposed during grading, documentation of the earthwork operations, and preparation of a final report.

Geologist for the preliminary investigation of the 80-acre Diamond Ranch High School site located in the City of Diamond Bar, California. Services included an analysis of historical aerial photographs, geologic field mapping, logging of exploratory borings and trenches, interpretation and analysis of the collected data, and development of remedial grading measures. Principal concerns were the mitigation of large landslides and the stabilization of cut slopes in steep terrain of the Puente Hills. The project included cut slopes up to 200 feet high with design cuts up to 150 feet deep. A rock rippability and ground water analysis were also crucial for the construction budget. This project required numerous meetings with design team members, school board representatives, city personnel, and the public.

Geologist for portions of the Newport Coast Development, a large, master-planned residential community overlooking the Pacific Ocean and Crystal Cove State Park in Newport Beach, California. Services for this project included planning, scheduling, and conducting geologic mapping and exploratory excavations in steep, rugged terrain; analysis of existing natural slopes as well as planned graded slopes; and preparation of preliminary geological reports. This work required a cooperative effort between members of the client's consultant team in order to develop viable solutions for safely building the project adjacent to ecologically sensitive slopes and canyons containing large landslides and difficult slope stability issues.

Geologist, for the preliminary feasibility studies, of a 2,000-acre residential project located in south Corona, County of Riverside, California. This large parcel encompassed uplifted alluvial fans and large stream channels emanating from the steep range front of the Santa Ana Mountains. The southernmost part of the site encroached onto the Elsinore fault zone, in addition to several large landslides at the base of the mountains. Preliminary studies included detailed geologic mapping, and extensive fault trenching to differentiate between the active and inactive strands of the fault zone. Later, borings and additional trenching to evaluate compressibility/collapsibility of the various types of alluvial soils, slope stability, landslide stability, construction sand resources, and foundation soils characteristics supplemented the preliminary studies.

Geologist for preliminary studies of a large hillside grading project (estate residential), City of Norco, County of Riverside, California. This project encompassed boulder-strewn hillsides underlain by granite as well as valleys filled with thick, wet sediments. Subsurface investigations were performed to evaluate rock rippability and to estimate the potential compressibility of valley soils under the weight of the proposed fill embankments. Ground water was also characterized in order to provide recommendations for grading and for the design of subdrain systems to reduce the potential for future ground water seepage.

Project Geologist for a 600-acre residential project in the Crafton Hills, San Bernardino County, California. In addition to residential areas, this project includes a major roadway, reservoir sites, an 18-hole golf course, and a country club. Located in moderately steep to gently sloping hills, the main geotechnical issues consisted of active faulting, compressible soils, and rock rippability. Field investigations were conducted to provide data for the Environmental Impact Report and Tentative Tract stages of the project.

Geologist for a portion of the Eastern Transportation Corridor through the Cities of Orange and Tustin, California. Services for this project included detailed geologic mapping, organizing and conducting subsurface field investigations, and preparation of the materials report used for construction of the multi-lane corridors and East Orange Interchange. This project, which included numerous bridges and a tunnel, passes through some of the steepest hillsides in the Santa Ana Mountains, resulting in cut slopes and fill embankments in excess of 100 feet high.

Geologist during investigation and grading of a multifamily residential site in Pomona, California. Located in hillside terrain underlain by hard, volcanic rock and cemented sandstone, preliminary services included rock rippability tests with heavy equipment, mapping for slope stability analyses, and drilling of the alluvial and older fill units. This was done onsite to determine their engineering characteristics. Grading services included detailed mapping, documenting areas of remedial grading, and report preparation.

PUBLICATIONS

St. Peters, K., 2003, Mitigation of Naturally Occurring Oil Seeps and Methane at the Olinda Ranch Residential Development, Brea-Olinda Oil Field: Technical Paper for the Joint Meeting of the American Association of Petroleum Geologists, and the Society of Petroleum Engineers, May 19-24, 2003, Long Beach, California.