**Threadlines of Geotechnical and Engineering Geology firms in Northern California**

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**Soil Testing Companies**

**Background on soil testing companies**

Compaction tests using California Test Method 216 have been required for public roads since 1929 (see descriptions under “*Notable Legislation and Associations that influenced development of the Geotechnical Standard of Practice*”) but were not required for private sector work. In 1950 the California Legislature enacted **California Administrative Code Title 21** (Public Works: Department of Public Works, Architecture, Highways, Toll Bridge Authority), which required materials testing, including soil compaction tests, for public buildings, streets, and trench backfill of buried utilities in public rights-of-way. Materials and soil testing firms sprang up overnight because of this legislation.

In the late 1950s several Bay Area agencies also enacted excavation and grading codes, similar to those developed in the Los Angeles Basin (see note on “*Adoption of Excavation & Grading ordinances in the Bay Area (1956-65)*” below, in section titled “*Notable Legislation and Associations that influenced development of the Geotechnical Standard of Practice*”).

**Pacific Chemical Works (1866-86); Abbot A. Hanks, Inc., Engineers, Assayers, Metallurgists, Chemists, and Soils and Foundations, and Construction Testing (1896-onward): Abbot A. Hanks Testing Laboratory (into the late 1970s)**

Abbot A. Hanks, Inc., Engineers, Assayers, Metallurgists, and Chemists, and Soils and Foundations, and Construction Testing was originally founded as the **Pacific Chemical Works** in 1866 by **Henry G. Hanks** (1826-1907) in San Francisco. Hanks then served as State Mineralogist, directing the California State Mining Bureau in San Francisco from its establishment in 1880 until 1886, when he re-opened his assaying business. His son **Abbot A. Hanks** (1869-1939) assumed ownership of the operations in 1896, and changed the firm’s name to **Abbot A. Hanks, Chemist, Assayer, and Metallurgist**, based at 531 California Street in SF. The company prospered under his guidance, expanding into allied markets, such as materials testing, and in the early 1950s, grew to include soils and foundation testing. During the post-war years the firm was based at 1142 Howard Street in San Francisco. **Leonard O. Long**, PE (1917-2010) supervising the firm’s soils and foundations work from about 1949 until his departure in 1964 (described under Berlogar-Long, in the Dames & Moore Threadline). **John de Becker**, PE (1914-2007) joined the firm in 1957, assisting Long in the soil mechanics and testing group, until affiliating with the Naval Facilities Engineering Command in San Bruno in 1969.

**Smith-Emery Co. (1904-present); Smith-Emery GeoServices (1972-2009); Smith-Emery Geotechnical and Geological Services (2010-present); Smith-Emery Laboratories and Geoservices (2014-present)**

 **Smith-Emery Co.** was originally founded in 1904 in San Francisco and expanded their services to include an array of testing services, for rebuilding of commercial structures following the San Francisco earthquake and fire of April 1906. The firm gradually developed into a materials testing, lab testing, and construction inspection services, with graduate engineers supervising most of these activities. The current **Laboratories and Geoservices** arm provides environmental and geotechnical testing and inspection services, employing geotechnical engineers, engineering geologists, and environmental specialists, working out of offices in Los Angeles, Anaheim, Fresno, and San Francisco.

In the 1990s **Keith Gilliam** (formerly of Lee & Praszker) supervised the geotechnical lab in San Francisco. **Patrick Morrison**, PG, **Anthony Argyriou**, PE, and **Miles Grant**, CEG (BS Geol ’86 USC) also worked for the San Francisco office in the 1990s, such as **Bill Wood**, GE and **Lutz “Yogi” Kunze**, GE who served as the firm’s principal geotechnical engineer in Los Angeles and directed the operations of **Smith-Emery Geoservices** between 1994-2001. In 2006 the firm moved its San Francisco Bay Area office from Hunter’s Point to the Bayview District of SFO. They also maintain branch offices in Los Angeles and Anaheim. **James E. Partridge**, PE became the current President and Owner around 1992. His son **Greg Partridge** joined the firm in 2003 and serves as Sr VP out of San Francisco. **Will** **Partridge** joined the firm in 2017 and serves as a VP out of their Anaheim or SF offices. **Patrick Morrison**, CEG serves as the GeoServices Division Manager of the firm’s Bay Area office and lab.

**O.J. Porter & Co. (1942-55); Porter, Urquhart, McCreary & O’Brien (1955-60); Porter, O’Brien & Armstrong (1962-65); Porter, Armstrong, Ripa & Associates (1962-67)**

In addition to the original office in **Sacramento**, branch firms/offices were established in **San Francisco** and **Los Angeles**, as well as overseas field offices, mostly associated with defense contracts. A separate firm, **Porter & O’Brien,** was incorporated in New Jersey and California in 1952, between Porter and civil engineer **Kenneth O’Brien**. O’Brien later moved to Los Angeles to manage the branch office of **Porter, Urquhart, McCreary & O’Brien** in 1952, which became **Porter, O’Brien & Armstrong** in 1962, and continued operating through 1968.

 In the fall of 1955 Porter formed another partnership with **Bruce D.** **McCreary** and **Ken O’Brien** called **Porter, Urquhart, McCreary & O’Brien** (PUMO), operating offices in Newark, New Jersey, Sacramento, Los Angeles, and San Francisco. The Sacramento, LA, and SF offices engaged primarily in west coast public works projects (transportation and water resources). In 1962 Porter brought in **Ellis Leroy Armstrong**, PE as a partner in **Porter**, **O’Brien & Armstrong** incorporated in California, with Porter listed as “managing partner.”

The San Francisco office operated as **Porter, O’Brien and Armstrong** (POA) between 1962-68. Their work focused primarily on highways, and this office continued operating in San Francisco until about 1965. The Sacramento office operated under the name **Porter, O'Brien, Consulting Engineers** until February 1966.  That year the name of the Sacramento operation was changed to **Porter, Armstrong, Ripa & Associates**. Pappy Porter's son, **James Porter** (1928-1987), was the Vice President of the firm and managed the Sacramento office. On December 18, 1967 Pappy Porter died in Madison, New Jersey. A few months later **Jim Kleinfelder** purchased the assets of Porter, Armstrong & Ripa’s office in Sacramento. These firms are described in more detail in the Caltrans Threadline, below.

**Hersey Inspection Bureau (1946-64)**

Around 1946 **James H. Dunn**, PE established the **Hersey Inspection Bureau** in Oakland, offering inspection and testing services, mostly in soil and subgrade compaction, pavement and materials testing. One of their first engineers was **Barney Vallerga**, PE. The business grew to include basic soils and foundation engineering and pavement design.

In April 1958, William F. Jones, PE, along with **Al Gribaldo**, PE (BSCE ’49 Berkeley), **Alvin Rathbun**, and **George R. Thenn, Jr.**, purchased Hersey Inspection Bureau to establish themselves in the East Bay market. Rathbun oversaw the business side of the various testing firms. Shortly afterward, they established a branch office in Concord, managed by **Gery Anderson**.

**Testing & Controls (1954-75)**

 Around 1954 **Testing and Controls** of Mountain View was founded by **L.** **Cedric Macabee**, PE (1903-83), who owned Macabee Engineering in Palo Alto, a firm that specialized in water resources and sanitary engineering in northern California. He hired **Albert C. Gribaldo**, PE from the California Division of Highways to run this office. Al was a 1949 graduate of Cal Berkeley in civil engineering, who had been working on the construction of the Nimitz Freeway (State Route 17) in the East Bay, and was an expert engineering draftsman. He was assisted by **Chuck Sillkock**, a surveyor from Macabee Engineering, who supervised the testing lab. The lab included a moist curing room for stoarage of concrete cylinders before testing. The on-call engineers who worked part-time for the firm were **Myron Jacobs** at Santa Clara University and **Jorge Barringa** at San Jose State. The soils technicians were **John P. Nielsen** and **Loren Saliday**. Nielson was a CE student at San Jose State who departed for graduate school in the fall of 1957, earning his MS at Wyoming and PhD in geotechnical engineering at Colorado before returning to the peninsula in 1961 to work for Al Gribaldo.

 Testing and Controls rented space in the building on San Antonio Road in Mountain View owned by **Peninsula Laboratories**, a full service commercial assay (minerals and petroleum) and testing firm, which also provided medical, chemical, botanical, and pharmacutical testing. In February 1958 **William F. Jones**, PE (MSCE ‘50 Caltech) resigned his position with Skidmore, Owings and Merrill and became a principal at Testing & Controls. In 1959 **Alvin A. Rathbun** (MBA ’57 Stanford) joined the firm as its business manager, and the company moved to larger quarters in a building near Moffett Field.

In 1971, **Dan Rhoades**, PE was a principal of GJA when he was also named President of Testing & Controls, who established a branch office in Concord to serve the Contra Costa County market. The other principals were **Robert D. Dewell**, PE, SE (1910-95), son of Henry D. Dewell, PE, as Vice President and Chief Engineer, **Richard L. McKillip** as Manager of Business Development, and **Donald Peard Kay**, PE as Staff Engineer. In 1975 Rhoades departed to start **Purcell-Rhoades & Associates** in Pleasant Hill, and the Concord office of Testing & Controls was closed.

**Testing Engineers, Inc. (1954-93); TEI (1994-present)**

 **Testing Engineers, Inc (TEI)** of 2811 Adeline St. in Oakland was an independent construction materials testing firm spun off from Woodward-Clyde Consultants in 1954. By 1970 it was being managed by **Merlyn Isaak**, PEand **F. Robert Preece**, PE. In the 1980-90s Isaak was Chairman of ACI Committee 506 on Shotcreting. The firm was reorganized in 1993-94 as TEI and is now based in San Leandro and operated by **Gary Snyder**.

**Peninsula Testing & Controls (1959-69)**

**Peninsula Testing & Controls** was founded by **Albert C. Gribaldo** and **Alvin A. Rathbun**, (1922-2011) around 1959. Rathbun had undergraduate degrees from Middlebury College in Vermont and Stanford (Class of 1950). After earning his MBA from Stanford he assumed the role of Secretary-Treasurer of Testing & Controls, Peninsula Testing & Controls, GJJ, and later, the Earth Systems firms. **David M. Wilson** was the senior engineering geologist with Peninsula Testing & Controls in 1962.

In July 1966 Peninsula Testing and Controls opened up a branch office in Pajaro to oversee the construction observation and testing work they were performing for Cabrillo Community College. This office was managed by **Jo K. Crosby**, PE and was the ***first business offering soil mechanics and foundation engineering services in Monterey County.***

**Stockton Testing & Controls (1961-66)**

**James H. Kleinfelder**, GE (1934-2017) received his BSCE degree from U.C. Berkeley in 1956 and worked for the California Division of Highways and the City of Stockton. While working as a resident engineer for Stockton in the early 60s, he had difficulty finding soils and testing firms based in Sacramento, who weren’t available for the testing required by Title 21. In 1961 Jim and his brother Ed started **Stockton Testing & Controls** to serve the growing market in San Joaquin County. In 1963 he bought out his brother’s share and established the firm’s first branch office in Merced. In 1963-64 Jim returned to Berkeley to secure a master’s degree in soil mechanics. In 1966 he changed the name of the firm to **J.H. Kleinfelder & Associates**. In 1968 they purchased the assets of Porter, Armstrong & Ripa in Sacramento, and opened their second branch office. The firm’s history and development is described in more detail below, under the Kleinfelder Threadline.

**Geo-Testing, Inc. (1967-77); Earl B. Hall, Inc (1977-93)**

Geo-Testing of San Rafael was founded by **Dennis Long**, PE, who served as Chief Engineer, and **Herbert J. Dix**, PE (BSCE ‘56; MS ‘59 Northwestern) as a principal engineer, from 1967-77. Dix had been a graduate student of Jorj Osterberg at Northwestern in the late 1950s, where he learned about geotechnical instrumentation. Dix had previously worked for Woodward Clyde and Porter, O’Brien & Armstrong. From June 1977 onward Dix continued geotechnical instrumentation work through **Earl B. Hall, Inc.** of San Rafael while also working for **VHS Associates**, Construction Management Services (profiled below). In 1988 **Charles C. Swensen**, PE (profiled below) assumed ownership of **Earl B. Hall., Inc.,** who provided geotechnical instrumentation services until the firm was dissolved in 1993.

**Geolabs-California, Inc. (1968-73); Geolabs-Northern California (1973-80): Geolabs, Inc. (1999 - present)**

This branch office evolved from the Geolabs office founded by engineering geologist Sheldon Medall in 1965, in the Los Angeles area. **Delmar D. Yoakum**, PE (BSCE ’62 Washington; MS ’63 Harvard) was their Principal Engineer who ran the branch office in Palo Alto from 1968 through Sept 1971, when he went down to Los Angeles to become one of the founding partners of Geosoils in Van Nuys. **Frank Berlogar**, PE (BSCE ’67 Berkeley) succeeded him as manager of Geolabs office in Palo Alto, until he departed to start up Berlogar-Long in 1973. He was succeeded by **Peter S.C. Chan**, PE, (BSCE ’66 Cal Poly Pomona) who managed the office, called Geolabs-Northern California, in the 1970s. On 1976 Chan formed PSC Associates (profiled elsewhere).

**Soil Services (1972-82); Construction Materials & Testing (CMT) (1982-present)**

**Soil Services**, a materials testing firm, was spun off of Gribaldo, Jacobs & Jones when that firm broke up, around 1972. They operated from an office in San Ramon in the early 1970s, run by **Max Gahrahmat**, PE (BSCE ’69; MS ’76 SJSU), with their senior soils tech **Don Rose**.

This operation later moved to Concord and changed its name to **Construction Materials & Testing**, or CMT. Their largest competitor was **Testing Engineers** of Oakland, a similar spinoff from Woodward-Clyde, managed by **Merlyn Isaak**, PEin the early 1970s. **Don Rose** continued as the principal soils technician.

**Soil Foundation Systems, Inc (1972-2002); Geotechnical Testing (1983-2000); Soil Testing (2000-unkn)**

Firm founded by **Kacey “K. C.” Chong Sohn**, GE (1935-2000) in May 1972 and based in Mountain View. In 1983 he founded **Geotechnical Testing**, based in Santa Clara. In 2000 he appears to have also established **Soil Testing**, based out of his home in Los Altos, not long before he passed away.

**VHS Associates (1974-present)**

VHS Associates was founded in January 1974 as a civil engineering and construction management company specializing in assessing insurance claims, designing repairs, and managing construction of repairs, licensed as engineers and contractors. They were originally based in San Rafael, and later moving to Novato. **Charles C. Swensen, Jr**., PE (BSCE ‘76 Cornell) joined the firm in 1980 after serving as a naval officer and assumed the firm’s presidency in January 1999. **Herbert J. Dix**, GE joined the firm in 1982 and served as Vice President for many years thereafter. VHS provided engineering assessment of damage claims, engineered suitable repairs, and offered construction management serviced for insurance companies. Herb retired and moved to Sunriver, and then Bend, Oregon. **Walter K. Weibezahn**, PE (BSCE ‘57 Berkeley) joined the firm in 1987 and served as an associate.

**Applied Geomechanics (1983-2007; 2011-present)**

 Founded by **Gary R. Holzhausen,** PG (BA Geol ’71 UCSC; MS ’73 and PhD ‘77 Stanford) in 1983 and based in Santa Cruz. They specialized in the installation and interpretation of precise tiltmeters, for which Holzhausen holds nine patents. These devices were used to instrument oil wells, nuclear power plants, dams, and slopes. In 2007 the firm was acquired by **Pinnacle Technologies** and its headquarters moved to San Francisco, and Holzhausen became Senior Advisor. In Feb 2011 the firm was purchased by Carbo Ceramics and Holzhausen returned to AGI as the General Manager, at their SFO office, where he remained until Jan 2013, when he became an independent consultant. The firm maintains branch offices in Denver, Chicago, and Boston.

**Insitu Tech (1983-87); VBI Insitu Testing (1987-98)**

 Founded in April 1983 by **D. Michael Holloway**, PhD, GE (BSCE ’68; MS ’69, PhD ’75 Duke) and **Virgil A. Baker** (BSCE ’76 Berkeley) of Woodward-Clyde’s Oakland office, when they purchased a Hogentogler digital cone penetrometer and had it mounted on Bob Lantz’s (RNL Enterprises) CME 750 All Terrain drill rig with balloon tires. ***They were the first firm to offer CPT services in the San Francisco Bay region***. Baker bought Holloway out in late 1987 and operated VBI Insitu Testing for 11 years, out of Oakland, before joining Taber Consultants in Nov 1998. In 2003 he joined Fugro, and since 2011 has served as Director of CPT Services for Fugro Consultants in Oakland.

**Cooper Testing Labs (1987-present)**

In 1987 **David Cooper** founded Cooper Testing Labs in Palo Alto, after working as a soils tech for Cooper-Clark from 1974-87. **Peter Jacke** (MSCE 1994 SJSU) joined the firm in 2002, after working for Earth Sciences Associates from 1984-91 and 1995-96. In 2015 he opened up a second office in the Portland area, which became Benchmark Geolabs in April 2017. Philip Jacke helps run the daily operations of the lab in Mountain View.

**John Sarmiento & Associates (1990-2001); JSA Cone Petetration Testing (2001-present)**

 A firm specializing in insitu subsurface testing and sampling, using a Hogentogler digital Cone Penetrometer rig. Founded as an MBE/SBE firm in May 1990 by **John Sarmiento**, PE (BA Geol SJSU; MSCE Stanford) in Menlo Park, and moving to Orinda, around 2001. Sarmiento formerly worked for the USGS in Menlo Park, where he supervised much of their subsurface site assessment work for the earthquake hazards group, working with **Tom Fumal**.

**Geolabs, Inc. (1996-present)**

 Geolabs-Hawaii funded the establishment of a separate California Corporation and office in Oakland around 1996, which was incorporated as a separate entity in February 1999. The Oakland office is managed by **K.** **Francis Chan**, GE. In the mid-1990s **Joseph I-Hung Sun**, GE (PhD Civil Eng ’89 Berkeley) operated another branch office in Taipei, Taiwan before accepting a position with PG&E Geosciences Department in San Francisco. The parent firm is based in Honolulu, originally founded by “**Bob” Y. K. Wong**, PE in 1975, and reorganized in 1991, with Wong retiring in 1997. It is now owned by **Clayton S. Mimura**, PE.

**Reese & Associates (2009-present)**

Reese & Associates was founded in June 2009 by **Jeffrey K. Reese**, PE and **Dan J. Figoni** (AA CE Tech ’84 Santa Rosa CC) and is based in Santa Rosa. Figoni supervises field operations and laboratory testing services. Their lab is under the direction of **Carlos Espana**, GE (profiled in the Sacramento area thread). Their clients have included the City of Santa Rosa, County of Sonoma, University of California, Sonoma State University and Santa Rosa Junior College, as well as other municipalities and school districts.

**Stanford University Threadline**

 The **Leland Stanford, Jr. University** was established in Palo Alto in 1891 by former California Governor and Central Pacific Railroad tycoon Leland Stanford (1824-93) and his wife Jane Lathrop Stanford (1828-1905) in memory of their only son, Leland, Jr., who died of typhoid fever at the age of 15. The university was established as a coeducational and nondenominational institution and was a founding member of the Association of American Universities in 1900. This was the organization that championed academic freedom and promoted the concept of faculty tenure. The university was heavily damaged by the April 1906 San Francisco earthquake, but tuition remained free to all students until the 1930s.

 The university is currently organized into seven schools: Humanities, Sciences, and **Earth Sciences**, as well as professional schools of Business, Education, Engineering, Law, and Medicine. Stanford has always been much smaller and considerably more pastoral than its cross-bay rival, the University of California, Berkeley. The current enrollment is about 7,000 undergraduate and 8,400 graduate students.

**Prof. John C. Branner (Stanford faculty 1891-1922)**

 The geology program at Stanford University dates to the school’s opening in 1891, when **John Casper Branner**, NAS (1850-1922) arrived in Palo Alto to begin teaching. Branner had graduated from Cornell in 1882 and received his Ph.D. in geology from Indiana University in 1885. He taught at the University of Indiana, and then served as Arkansas State Geologist before coming to Stanford.

 Upon his arrival in 1891 Branner oversaw the development of the university’s **Department of Geology and Mining**. He sought to institute a geology curriculum emphasizing the practical application of geology in mining, petroleum, and construction engineering. In 1892 his first faculty appointment was **James Perrin Smith** (PhD Geol 1892 Gottingen) of the US Geological Survey as a Professor of Paleontology. One of Branner’s earliest additions was **Austin Flint Rogers** (PhD 1902 Columbia) as a professor of mineralogy and petrology in 1905. In the wake of the April 18, 1906 San Francisco earthquake he was appointed to the ***California Earthquake Investigation Commission***. Branner’s emphasis on practical application led to his selections of **C. F. Tolman** in 1912 and **Bailey Willis** in 1915 as key members of the geology faculty (described below). These appointments assured Stanford’s assertive role in developing one of the nation’s finest programs in applied geology, which had an enormous influence on the burgeoning mining and petroleum industries of the early 20th Century in the western United States.

 Branner’s technical expertise was sought after more than any other geologist in California during his lifetime, which really predated the era of boards of consultants, which began in the 1920s, after Branner had passed away. His first consultations in engineering geology were as an ad hoc consultant to Los Angeles engineer William Mulholland on the Los Angeles Aqueduct while it was under construction, from 1907-13. He also served as a consultant on a number of dams, such as the Gibraltar Dam near Santa Barbara in 1915, and to the Spring Valley Water Company of San Francisco, during its decade-long efforts to design the Hetch Hetchy Aqueduct and storage system. In 1916 Branner was inducted into the ***National Academy of Sciences*** and President Woodrow Wilson appointed him as a member of the National Academy panel charged with investigating the enormous landslides affecting the Panama Canal (that panel did not issue their report until 1924). Branner also served as a consultant on the 1918 Calaveras Dam slope failure, dispatching his protégée Hyde Forbes to work on the forensic assessment of the liquefaction failure of the dam’s upstream shell when it was close to being completed.

 Professor Branner served as Stanford University’s vice-president from 1898 to 1913, whereupon he became that university’s second president, retiring three years later, in 1916. He died in March 1922. Some of Branner’s more notable students included: President **Herbert Hoover** (BA geology and mining, 1895), **Lou Henry** (Mrs. Herbert Hoover) (BA geology 1898), UCLA geology **Professor William J. Miller** (graduate study 1900-02), Stanford Engineering Professor **Theodore J. Hoover** (BA geology and mining, 1901), pioneer petroleum geologist **Harry R. Johnson** (BA 1909), Stanford Mining Professor **Waldemar F. Dietrich** (BA Geology & Mining 1913; EM 1914), future California State Geologist **Olaf P. Jenkins** (BA 1913, MA 1915), California’s first engineering geologist **J.** **Hyde Forbes** (BA 1914), and **Wayne Loel** (BA 1916, MA 1917), a consulting geologist in Los Angeles throughout the 1920s and 30s, who later served as president of Burnoel Petroleum, Winston Copper, and Winston Minerals Corp.

**Prof. C. F. Tolman (Stanford faculty 1912-38) economic geologist, hydrologist, and engineering geologist**

 **Cyrus Fisher Tolman** (1873-1942) was born in Chicago in June 1873 and attended the University of Chicago, completing his BS in geology in 1896, after completing 2-1/2 years of graduate work and teaching. In 1899 he accepted a position in the mines of Butte, Montana until 1905, when he joined the University of Arizona as a Professor of Geology and Mining, replacing **William P. Blake** (who had made the first geological map of southeastern California with the Williamson Survey in 1853-55). He also served as territorial geologist from 1910-12.

 In 1912 Tolman joined the faculty at Stanford, where he initially developed a respected program in economic geology. His tenure in Arizona led to a long-term relationship with ASARCO as one of their preeminent consultants, and in 1921 they hired Tolman to supervise teams of geologists who pioneered the use of depositional ore models to search out porphyry copper deposits in Arizona and Mexico. This technique was so successful it became the industry standard for exploration of strategic minerals for the next 75 years. California’s dependence on water for its economic development led Professor Tolman to become one of the premier figures in the development of hydrogeology. This led to the publication of his authoritative textbook “***Ground Water***” by McGraw-Hill in 1937. With 593 pages and 189 illustrations, it quickly emerged, in the words of reviewer **O.E. Meinzer**, as “***the most comprehensive textbook on this subject in English*”** for several decades thereafter, and established Stanford as a leading school for the study of hydrogeology.

 Officially a Professor of Economic Geology, Tolman was known as the “Chief” by all the Stanford students because of his broad expertise. He taught students in the geology curriculum, those in economic geology, petroleum geology, structural geology, hydrogeology and even in engineering hydrology.

Tolman’s pioneering work included the recognition of “hidden faults,” revealed across California as linear groundwater barriers (the first book he published was “***Graphical solutions of fault problems***,” published in 1911). Some of the faults discovered in this manner included: the Concord-Green Valley fault systems and the Niles-Irvington [Hayward-Mission] faults in the San Francisco East Bay area. Of particular note was his early work on recognizing the impact of “pressure relief” from overdrafting of water wells with observed ground subsidence, and the hydrologic regimes typical of stratified alluvial fans, mostly in California.

 His technical expertise in engineering geology was much sought after in the 1920s and 30s, when he was appointed to numerous consulting and expert review panels, for such studies as the March 1928 St. Francis Dam failure, the 1929 San Gabriel Forks Dam review board, and the Board of Consulting Engineers to the Los Angeles County Flood Control District (1931-38). Tolman retired from Stanford in June 1938 and died of a heart attack while working on a consulting project under construction in Spokane, Washington, in October 1942. Tolman mixed with many giant figures of his day, including the “father of groundwater hydrology” **O.E. Meinzer** of the USGS in Washington, DC; USGS geologist **Myron L. Fuller**, (who wrote the 1908 article “*Summary of the controlling factors of artesian flows*,” USGS Bulletin 319); consulting hydrologist **Charles H. Lee** of San Francisco; engineering geology Professor **Allen E. Sedgwick** at USC; consulting engineer **Louis C. Hill** of Los Angeles; and **Rollin Eckis** of Richfield Oil Co. Some of Professor Tolman’s more notable hydrology students included **Malcolm “Mike” B. Kildale** (BA Geol 1921; MA ‘24, PhD ’38 Stanford), who joined the Stanford faculty, **Cecil C. Killingsworth**, **B. Cooper Hyde**, and **Joseph F. Poland** (who wrote two chapters of Tolman’s ***Ground Water*** text).

**Prof. Bailey Willis, engineering geologist (Stanford faculty 1915-1949)**

 **Bailey Willis**, NAS (1857-1949) was born in Idyllwild, New York. He attended Columbia School of Mines, where he was granted diplomas as Engineer of Mines in 1878 and Civil Engineering in 1879, and an honorary doctorate from the University of Berlin in 1910. His scholastic training in mining geology *and* civil engineering probably makes him the ***first formally trained engineering geologist in America***. He worked for the U.S. Geological Survey between 1884-1916, carrying out field work in many parts of the United States. After working as a special agent to the 10th U.S. Census (1879-1881), he was given charge of the Pacific Division of the Northern Transcontinental Survey of the U.S. Geological Survey between 1884-89; from which he became geologist in charge of the Appalachian Division, USGS, between 1889-91; thence editor of geologic maps for folios of the Geologic Atlas of the United States (1891-93). In 1895-97 he was given charge of USGS studies in the Cascade Range and Puget Sound Basin, then returned to his duties on the Geologic Atlas of the U.S. between 1897-1902. In 1897 he was one of the four original civil servant geologists hired by the USGS as permanent appointees (Ransome, Mendenhall, Spencer, and Willis).

 In 1902 he embarked on an overseas career, travelling to China under the auspices of the Carnegie Institution of Washington during 1903-04. He was a lecturer at Johns Hopkins (1895-1902), the University of Chicago (1909), and detached himself to the Ministry of Public Works of Argentina in 1911-15.

 In 1915 he succeeded John Branner as Head of the Department of Geology and Mining at Stanford until 1922, from whence he retained his residence and position as professor emeritus, until his death 27 years later. During his remarkable retirement, Willis continued to work all over the world, and published extensively on the structure of East Africa and Patagonia. He was appointed to the ***National Academy of Sciences*** in 1920, the second professor from California to be so honored.

 He served as President of the Seismological Society of America between 1920-25. In 1923 Willis authored a series of articles on ***Earthquake Risk in California*** in the SSA Bulletin. In these Willis asserted that the underwriters of insurance in California should estimate a severe earthquake occurring somewhere in California more or less loss, every 25 years. Additional articles followed, mostly within the insurance underwriting literature, over the next few years. He particularly emphasized measurements of crustal strain and dilation being made by the USGS in vicinity of Palmdale, which were suggestive of increasing strain along the southern San Andreas Rift (these turned out to be incorrect, but Willis didn’t know that).

 Willis’ assertions received an enormous boost in the wake of the devastating earthquake that struck Santa Barbara in late June 1925. The quake damage and Willis’ dire predictions caused earthquake insurance rates to skyrocket between 100% and 2,200% in a single year (in 1927-28). In 1927 the Los Angeles Chamber of Commerce hired retired USGS geologist **Robert T. Hill** to prepare a formal response to Willis’ doomsday assertions, summarized in a book titled *Southern California Geology and Los Angeles earthquakes*, released by the Southern California Academy of Sciences in late March 1928. Despite the fact that Hill’s book was stuffed with nonsensical arguments (e.g. there is…”absolutely no risk of damaging earthquakes to Los Angeles and vicinity,” etc.), it had the desired impact of lifting the embargo on construction loans in the Los Angeles area. It would be several more decades (after the Imperial Valley earthquake of 1940) before Willis’ dream of seismic provisions in building codes would be adopted in Los Angeles and San Francisco.

 In 1934 Willis and Berkeley geology Professor **Andrew Lawson** got into a heated debate about the stability of the serpentine foundation supporting the South Tower of the Golden Gate Bridge. Lawson had been named consulting geologist for the bridge project in the late 1920s and had supervised the initial exploration of the anchor and tower sites in 1929-30, which included six exploratory holes and a plate load test of the South Tower, beneath 65 feet of water, about 1,125 ft off Fort Point. The plate load test employed a 20-inch square steel post, which withstood a normal force of 33 tsf before bearing failure, which was more than double the intentioned structural load. In early 1934 excavations for the south Tower began, and over 60,000 yds3 of rock was removed with aid of explosives. The excavations were carried down to a depth of approximately -100 feet below sea level, to create a suitable socket in the Franciscan Mélange. Additional core borings were carried out at this time, including one hole taken to -259 ft below sea level. Once the foundation socket was excavated, new plate load tests were carried out using 12-inch square columns of wood, loaded with iron ingots on a steel plate. These tests indicated a bearing capacity of 33 tsf, while the towers design load was only 11 tsf. After the caisson was de-watered Willis made a personal inspection of the mélange exposed in the excavation. He felt that the seams of serpentine could serve as planes of weakness that could cause a catastrophic failure of the South Tower. This criticism from such a respected luminary of engineering geology created considerable consternation, but Lawson’s views prevailed because he was project geologist and the Board of Consultants (O.H. Ammann, Charles Derleth, and Leon S. Moisseiff) felt that the margin of safety for bearing (FS = 3) was adequate. The two giants of Bay Area geology never collaborated or served on any panels again. Willis continued writing books of structural geology with his son **Robin Willis** (BA Geol 1920; MA 1923 Stanford) and teaching geology courses at Stanford until he died in 1949, at the age of 92.

**Prof. Eliot Blackwelder (Stanford faculty 1922-45)**

 Like C.F. Tolman, **Eliot Blackwelder**, PhD, NAS (1880-1969) was born in Chicago and attended the University of Chicago from 1897-1901, working under R. D. Salisbury. He taught at Chicago for two years before embarking for China with Bailey Willis as part of the geological expedition sponsored by the Carnegie Institution. Upon their return he taught geology at the University of Wisconsin from 1905 until 1916, during which time he spent his summers mapping various parts of the western US and working on his doctorate at the University of Chicago, which he completed in 1914. From 1916-19 he taught at the University of Illinois, spending his summers in Alaska mapping for the USGS. He came to Stanford as a visiting professor in the summer of 1919, but cut his stay short when he accepted a position as chief geologist of Argus Oil Co. in Denver. The lure of academia, with summer studies in new locations and writing up his thoughts, brought him to Harvard’s faculty in 1921. When Bailey Willis retired in 1922, he enticed Blackwelder to succeed him as chair of the geology program at Stanford, a position he held until his retirement in 1945.

 Blackwelder’s professional interest centered around field geology, with particular emphasis on the geomorphology of desert landforms and alpine glaciation. His work on debris flows in the Wasatch Mountains of Utah (in the 1920s), agents of rock weathering and exfoliation, sand blasting, moraines, landslides, fault scarps, alpine lakes, Pleistocene lakes in the Great Basin (like Lake Manley, which became playas), desert varnish, talus slopes, and even meteor craters had an enormous impact on geomorphology and engineering geology practice in the western United States. His work on the evolution of the Colorado River across Utah and Arizona influenced many of the engineering decisions of his era, when major dams were being planned. He was elected to the National Academy of Sciences in 1936 and served as president of the Geological Society of America in 1940 and Seismological Society of America in 1947-49. After he stepped down as geology department chair in 1945 he focused his energies on helping achieve a lasting peace between developed nations by aligning himself with the Atlantic Union, rebuilding Europe after the Second World War.

**Prof. Siemon W. Muller (Stanford faculty 1930-70) – originator of the term “permafrost”**

 **Siemon William (“Si”) Muller** (1900-70) was born near the border between Siberia and Manchuria in 1900, where his Danish father was working on the Trans-Siberian Railway’s telegraph line. At the time of the Russian Revolution in 1917 Si was enrolled in the Russian Naval Academy at Vladivostok. He later escaped to Shanghai, where he was employed by an American firm and learned to speak English. He immigrated to the United States in 1921 and followed his older brother Bill to the University of Oregon where he received his BS in geology in 1927. He then received a graduate assistantship at Stanford, working for Prof. James Perrin Smith in paleontology and stratigraphy, receiving his master’s in 1929 and PhD in 1930. He was the geologist who discovered the enormous fossilized Ichthyosaurus fossils near the old mining town of Berlin, Nevada, where more than 40 of these creatures were documented, some over 50 feet long (now preserved with Berlin-Ichthyosaur State Park). He immediately joined the Stanford geology faculty as an assistant professor and was promoted to associate in 1936 and full professor in 1941. His career focused on paleontology to interpret the origins and history of stratified deposits of the Mesozoic and Paleozoic in western North America, with particular emphasis on the stratigraphy of the Triassic Period.

 With America’s entry into the Second World War in December 1941, the United States and Canada promptly undertook construction of airfields, which required a trans-Alaska-Canada (Alcan) Highway, the pioneer road which was blazed in 1942. They encountered numerous problems with construction of frozen ground which became thawed, ruining much of their grading. The Army Corps of Engineers turned to the U.S. Geological Survey, who soon found that the only published works on construction on frozen ground had been by the Russians in Siberia. In searching for a competent American geologist fluent in Russian they settled on Si Muller at Stanford. He was coerced into federal service as an employee of the USGS for the duration of the war.

 With the Survey’s help in Washington, DC, Muller compiled an exhaustive summary of the Soviet literature on permanently frozen ground. By early 1943 Miller had translated and digested the available Russian literature and developed a brief for use by Army and US Bureau of Public Road engineers who were working to complete the Alcan Highway. Muller then conducted extensive field surveys of the Alcan Highway and the various locations proposed for American and Canadian airfields. He was accompanied by USGS geologists **Robert F. Black**, **Robert E. Wallace**, and **Max Elias**. It was at this time that Mueller coined the English term “***permafrost***” to describe permanently frozen ground, and it quickly took hold. The “permafrost research program” was then turned over to the USGS, which they have continued ever since. Muller was cited by the Army for his distinguished contributions to the war effort and received the Freedom Medal, the highest award then available to civilians (now called the Presidential Medal of Freedom). During the war everything Muller prepared was classified. After the war he sought to get his reports declassified so that other scientists could benefit from the considerable experience and expertise the Americans and Canadians had made during the war.

 In 1947 he privately published these notes as “***Permafrost or Permanently Frozen Ground and Related Engineering Problems***” (J. W. Edwards, Inc., Ann Arbor). This 231 page tome became most cited text on that subject of all time, in large part because of Muller’s beautiful pen and ink drawings, which include numerous illustrative cross sections, as well as his technical summaries of the Russian literature, including their photos and drawings. .

 During the post-war period Muller’s increasing international notoriety for his work in permafrost interrupted his work with stratigraphy and paleontology. One of his students, **Troy L. Pewe**, CEG completed a doctoral dissertation on permafrost in the Fairbanks area in 1952, working with the USGS. Pewe became one of the academic experts on the subject for the balance of his career. Sometime in the early to mid-1950s Muller began preparing a more comprehensive manuscript on the subject of permafrost and related engineering problems, which he appears to have worked up through 1962-63, but not thereafter (the latest references he cites are in 1962). Muller retired from the Stanford faculty in 1964 and died unexpectedly in his sleep on September 9, 1970.

In the fall of 1970 Muller’s papers and research materials on permafrost were passed onto his protégée Professor Troy Pewe at Arizona State University, who then passed them onto Prof. **Hugh M. French** at the University of Ottawa in July 1996. French dove into Muller’s papers and was delighted to discover a typed manuscript, which he and Prof. **Frederick E. Nelson** at the University of Delaware eventually published in 2007, 37 years after Muller’s death. The book is titled “***Frozen in Time: Permafrost and Engineering Problems***,” and was published by the American Society of Civil Engineers (it is more elegantly illustrated than Muller’s 1947 textbook).

**Prof. Stanley N. Davis, CEG (Stanford faculty 1954-1966)**

 **Stanley Nelson Davis** (1924-2007) was born of American parents in Rio de Janeiro but grew up in the San Joaquin Valley. He served in the Army in the Pacific Theater from 1943-46. He then attended the University of Nevada-Reno on the GI Bill, receiving his BS in geology in 1949. He continued his education at the University of Kansas working under **John C. Frye** (MS 1951), then taught at the University of Rochester, while working on his doctorate at Yale under **Richard Foster Flint**.

 He began teaching at Stanford in 1954 and secured his Ph.D. in 1955. His scientific interests spanned many different aspects of applied geology and hydrogeology, including microstrains produced by the withdrawal of ground water, groundwater tracers, examining natural radionuclides in groundwater, and the history of hydrogeology. Beginning in 1958 he served on numerous panels and committees examining the disposal of radioactive waste below ground, at Savannah River, Hanford, Oak Ridge, and the Nevada Test Site. He credited his Stanford colleague **Konrad B. Krauskopf** for encouraging him to find the right balance between scholarship, research, and teaching. Davis also investigated the seismically-induced landslides at Lago Rinihue, Chile during the Great Chilean Earthquakes of May 1960.

He is best remembered for his textbook ***Hydrogeology***, co-authored by Princeton Hydrogeology Professor **Roger DeWiest** (PhD civil engineering ’59 Stanford), which appeared in 1966. It was the seminal text on the subject for three decades, and was translated into Spanish, Russian, and Japanese. He supervised the theses of dozens of master’s students and 20 PhDs. Some of his PhD students at Stanford included **Francis R. Hall** and **Ray Pestrong**, who went onto academic careers.

 In 1966 Davis left Stanford to become chair of the geology program at the University of Missouri-Columbia, then onto Indiana University at Bloomington. In 1975 he moved to the University of Arizona to assume the chair of the Department of Hydrology & Water Resources, where he remained until his retirement. In 1976 he co-authored the text ***Geology, Our Physical Environment*** with his former Stanford student **Ray Pestrong** and University of Buffalo Dean **Paul H. Reitan**. In 2000 he prepared notes for the Chester C. Kisiel Memorial Lecture titled “***Our heroes in hydrogeology and their messages for today***,” a concise overview of how hydrogeology evolved and the role that many Stanford faculty and students contributed to it.

**Prof. Richard H. Jahns, CEG – Dean, School of Earth Sciences (1965-83)**

 A native of Los Angeles, **Richard H. “Dick” Jahns**, CEG (1915-83) grew up in Seattle. He entered Caltech at age 16 (1931), while living with his grandparents in Alhambra. He received his BS in geology in1935, followed by an MS at Northwestern in 1937. He then took a position with the USGS while working on his doctorate at Caltech in 1939, which he completed in 1943. He joined the geology faculty at Caltech in 1946, where he remained until 1960. During that time, he was part of the team that evaluated the subsidence of the Wilmington Oil Field, which impacted the Baldwin Hills Reservoir. While teaching at Caltech he began working with Caltech soil mechanics Professor **Fred Converse** and developed a course in engineering geology for earth sciences and civil engineering students. He also developed a life-long relationship with Los Angeles home builder **Barney Morris**, who endowed the Morris Chair in Geology at Stanford in 1985.

 Dick accepted the position as department chair at Penn State in 1960, then Dean of the College of Mineral Industries, in 1962. In the summer of 1965 he moved to Stanford to become the Dean of the School of Earth Sciences, and his first administrative action was to establish a separate **Department of Applied Earth Sciences**, which included engineering geology. Dick’s course in engineering geology was one of the most popular on campus, and he continued teaching it every fall, even after his retirement in 1979.

 Dick Jahns had an enormous impact on the development of grading and excavation codes during the 1950s, when Los Angeles was bursting with hillside development. He served on the first ad hoc ***Geologic Hazards Committee*** appointed by the City of Los Angeles in January 1956. This led to the establishment of the City of Los Angeles ***Engineering Geologist Qualifications Board*** in February 1958, to which he was appointed Chairman. The board prepared a document titled “***Desired Content of Geological Reports***,” which was edited by Jahns and widely distributed, beginning in May 1960. In June 1962 Jahns refined this with a follow-on document titled “***Desired content of geological reports submitted to the Department of Building & Safety, City of Los Angeles****.*”

 After moving to Stanford, he was one of the original members and elected the first Chairman of the ***California Seismic Safety Commission*** when it was formed in 1975, serving until his death in 1983. He possessed a vibrant sense of humor and self-demeaning character that endeared him to most everyone he met. He passed away on December 31, 1983 at the age of 68, much to everyone’s regret. Some of Dick’s students who went onto distinguished careers in engineering geology included: **Clarence R. Allen, Gordon Eaton, Gene Shoemaker, Perry Rahn, Tom Holzer, John Williams, Karl Vonder Linden, Jim Baker, Kerry Sieh, Gary Holzhausen, Rex Upp, Betsy Mathieson**, **Peter Davies**, and **Randy Jibson**, among others.

**Prof. Arvid M. Johnson, CEG (Stanford faculty 1965-78)**

 **Arvid Johnson** (1938-2018) grew up on a ranch near Dee, Oregon, north of Mt Hood. He studied geology at Portland State and the University of Oregon (BA Geol ’58). He then mapped the geology of Malhuer County in eastern Oregon for his master’s thesis (MA ‘61 Oregon). He did his doctorate on debris flow mechanisms under **Gene Williams** at Penn State, graduating in 1965. Dick Jahns was on his thesis committee, which helped him secure a faculty position at Stanford, both men moving west in the late summer of 1965. Arvid was a true “renaissance man,” whose interests were broad rather than narrow. His initial research emphases were in structural geology, geomechanics, engineering geology, and surficial processes. His first book, titled ***Physical Processes in Geology*** was published by W.F. Freeman in 1970, and considered the classic work in this field for many years thereafter. His pioneering work on debris flow mechanisms was of tremendous import to applied geology and geomorphology. In 1974 he co-authored ***Analysis of the Mobilization of Debris Flows*** (with **Jim Rodine** and **Ernie Rich**), which became an oft-cited reference by the next generation of researchers, who included a number of Johnson’s former students, such as Monty Hampton and Dick Iverson.

 Arvid was a registered geologist and certified engineering geologist in California and served as the ***first municipal geologist in the Bay Area*** when he was named the ***Town Geologist*** for Portola Valley in 1969. He established respected standards for geologic peer review and geohazard mapping, emulated by other municipalities for many years afterwards. Johnson enjoyed teaching courses on engineering and geological seismology and landslides. In the summer of 1978 he left Stanford to take a position at the University of Cincinnati as Professor of Geomechanics and Dynamics. While there he worked with Atilla Kilinc to develop an innovative year long course called “*Physical and Chemical Processes in Geology*.” He also convinced the City of Cincinnati to hire their first engineering geologist (one of Arvid’s MS students, Rich Pohana) to help them evaluate the recurring problems with slope instability. He remained there until June 1988, when he accepted the position as Chairman of the Department of Earth and Atmospheric Sciences at Purdue University. During his Purdue years he undertook detailed studies of surface deformation during large earthquakes, documenting and explaining how surface cracking could be used as a guide to interpret deep seated tectonic deformation. He and colleague **Ray Fletcher** wrote a book titled "***Folding of Viscous Layers***," which is probably the most advanced mechanical analysis yet of the folding of layered rocks. He retired from Purdue in June 2003. Some of his graduate students who went onto notable careers in engineering geology included: **David Pollard**, **Steve Ellen**, **Bob Fleming**, **James Rodine**, **Syd Peng**, **Monty Hampton**, **David Keefer**, **Alexander Soto**, **David Hoexter**, **Russ Dyer**, **Larry Murdoch**, **Bill Haneberg**, **Rex Baum**, **Rich Pohana**, **Kaj Johnson**, and others he influenced significantly, such as **Gary Holzhausen** and **Dick Iverson**.

**Prof. Irwin Remson, CEG (Stanford faculty 1968-96)**

 Irwin Remson (1923-2013) was born in January 1923 and attended Columbia University for all of his education, receiving a BA in physics in 1946 and an MA in geology in 1949. He then joined the US Geological Survey, where he helped develop unsaturated flow theory using theoretical methods, coupled with field verification. This work led to his successful completion of a PhD in Geology at Columbia, titled “***Hydrologic studies at Seabrook, New Jersey***,” awarded in 1954. He then accepted a position as Lecturer in Civil Engineering and Mechanics at Drexel University in Philadelphia, where he rose to full professor rank by the time he departed in 1968.

 That year he accepted a position as Professor of Geology at Stanford, bringing with him two of his Drexel graduate students, George Hornberger and Fred Molz. At Stanford he soon found hydrologists Ray Linsley and Joe Franzini in the civil engineering department and benefited from the mutual training and interdisciplinary cooperation that were to become Stanford hallmarks. Remson, Hornberger, and Molz collaborated to write the textbook ***Numerical Methods in Subsurface Hydrology***, released by John Wiley & Sons in 1971. This quickly became one of the most cited references in hydrogeology. In 1970 Remson became a registered geologist and certified engineering geologist in California. In 1975 he was named Chairman of the new Department of Applied Geology at Stanford, which he held until in 1982.

 Remson was one of the most productive faculty members at Stanford, pioneering new techniques of groundwater modeling, hydrologic optimization, solute transport, hydrogeology, and unsaturated flow. He taught courses on using the finite difference method, finite elements, hydrogeology, and the year-long course on environmental earth sciences. Remson also did an enormous amount of consulting work, which kept him in contact with the evolving standard-of-practice. His clients included the National Research Council, the Army Corps of Engineers, Oak Ridge National Lab, USGS, DOJ, DOE, MWD, Battelle, Rockwell, and many Bay Area firms.

 He retired from Stanford in 1996 at age 73, and died in February 2013, at the age of 90. During his career he co-authored more than 80 technical articles and supervised an impressive array of PhD and master’s students who became respected leaders of hydrogeology, including: **Leland Jan Turk** (’70), **Maurice D. Veatch** (’70), **George H. Hornberger** (’70), **Fred Molz** (’70), **Steve Egemier** (’73), **Mary Pikul Anderson** (’73), **Nick Sitar** (’75), **Jeff Gilman** (’75), **Richard Weiss** (’80), **Joe Poland** (’81), **John W. Reeder** (’81), **Steven M. Gorelick** (’81), **Peter B. Davies** (’85), **Eric Reichard** (’85), **Barbara Evans** (’85), **Richard M. Iverson** (’85), **Ken Belitz** (’85), **Steve Ingebritsen** (’86), **Jean Marie Bahr** (’87), **James J. Butler** (’87), **Hedeff Essaid** (’88), **Stuart Rojstaczer** (’88), and **Leah Lucille Rogers** (’93).

**Department of Applied Earth Sciences (1966-2012); School of Earth, Energy & Environmental Sciences or Stanford EARTH (2012-present)**

 The Department of Applied Earth Sciences was established in 1966, shortly after Dick Jahns arrived to take over the reins as Dean of the School of Earth Sciences. It was comprised of programs in Applied Earth Sciences, Geology, Geophysics, and Petroleum Engineering. The Applied Geology program allowed undergraduate students to emphasize the following specialties: **Environmental Earth Sciences**, **Land Resources Planning**, **Metallurgy** (with the School of Engineering), and **Ore Deposits**. In 1966 Jahns brought in **Fredrick C. ‘Fritz’ Kruger**, RG (PhD ’41 Harvard), Chief Geologist of International Minerals and Chemical Corporation, to lead the applied geology program until 1975, when he was succeeded by **Irwin Remson**.

 The graduate programs of study leading to MS, Engineer’s degree (The Engineer Degree required 90 quarter units and a thesis), or PhD degrees included: **Applied Geomathematics**, **Applied Hydrogeology**, **Engineering Geology**, **Environmental Earth Sciences, Extractive Metallurgy and Materials Processing, Mineral Economics, Ore Deposits** **and Exploration**, **Petroleum Exploration**, and **Remote Sensing-Airborne Exploration**.

In the 1970s the Applied Earth Sciences faculty included: **Richard H. ‘Dick’ Jahns**, CEG, **Irwin Remson**, CEG, **Ronald J.P. Lyon**, RG, **John W. Harbaugh**, RG, **George A. Parks**, **Norman A. Parlee**, **Marco T. Einaudi**, and **Bernard Hallet** (until 1980). Visiting and affiliated faculty included **Paul Switzer**, RG, **Dick Meehan**, PE, GE, **George Mader**, AICP, **Jeffrey A. Gilman**, CEG, CHG, and **Jacob Rubin** (1919-2007) (BS ’39; PhD Soil Physics ’49 Berkeley), chief scientist in the USGS Water Resources Division and founder of the USGS National Water-Quality Assessment Program.

 In 2012 the Applied Earth Science and hydrogeology programs were absorbed into Stanford’s new **School of Earth, Energy & Environmental Sciences**, to capture the breadth of multi-disciplinary and cooperative research that the faculty was involved in. This school is comprised of the the Departments of Geophysics, Geological Sciences, Energy Resources Engineering, and Earth Systems Science, and two interdisciplinary programs: The Emmett Interdisiplinary Program in Environment and Resources (E-IPER) and the Earth Systems Program, and a multidisciplinary degree program in Computational Geoscience.

**Others who taught engineering geology at Stanford**

 Dick Jahns taught the graduate course in ***Engineering Geology*** each fall between 1966 until a few weeks before he died in December 1983. From the mid-1970s through the mid-1990s geotechnical consultant **Richard L.** ‘**Dick’ Meehan** (President of Earth Science Associates) taught courses in ***Geotechnical Practice*** and ***Engineering Geology of Quaternary Sediments***. A course in ***Engineering Geologic Mapping*** was taught by **Dick Jahns**, CEG, **Arvid Johnson**, CEG, **Ernie Rich**, RG, **Bill Cotton**, CEG, **Tim Hall**, CEG, and many of the more seasoned PhD students in the Applied Geology program, such as **Steve Ellen, John Williams, Bob Fleming, Dave Pollard, Dave Keefer, Rex Upp, Richard Iverson, Randy Jibson**, etc. A year-long series of three ***Environmental Earth Sciences*** courses were team-taught by hydrogeologist **Irwin Remson**, CEG and environmental planner **George Mader**, AICP. Each quarter there was also a graduate **Seminar in Engineering Geology**, coordinated by **Dick Jahns**, **Arvid Johnson**, or **Bernard Hallet**.

 When Dick Jahns died in December 1983, Stanford tried to fill the gap by using engineering geologist **Bill Cotton**, CEG as an adjunct member of their faculty, because of his teaching abilities (he had taught at Pasadena City and DeAnza Colleges for many years). Bill’s firm, Cotton-Shires & Associates, was growing rapidly and Bill was in much demand as an expert witness, so his term was limited to 1990-93. The program was more or less carried by **Dick Meehan**, GE, who had shut down Earth Science Associates California operations in 1985 and maintained a consultancy adjacent to the Stanford campus. He taught courses in engineering geology or geotechnical practice up thru 2006. They also used **Tim Hall**, CEG (PhD Geol ’84 Stanford) of Geomatrix to lecture in engineering geology during the 1990s (he had also previously taught geology at DeAnza College). Engineering Geology & Global Change (CEE 196/GS 115) later taught by **Tom Holzer**, CEG (MS ’66, PhD ’70) of the USGS.

**Stanford trained engineering geologists**

 Stanford trained a significant number of engineering geologists who went onto stellar careers. These included: **Harry R. Johnson** (BA 1905), **Robert B. Moran** (BA 1907), **J. Hyde Forbes** (BA 1914), **Joseph Poland** (BA 1929; MA 1935), **Cecil C. Kilingsworth** (BA 1929; MA ’31), **U.S. Grant, IV** (PhD 1929), **Thomas F. Thompson** (BA 1931), **Edward J. Zielbauer** (BA 1931); **Ward C. Smith**, RG (BA 1931), **Ben Page** (BA 1933), **Bruce McCreary** (BA 1939), **Laurence B.** “**Larry” James** (BA 1940), **Ray Taber** (BS ’48), **Harold W. “Bill” Burke** (BS ’48; PhD ’53), **G. Sidney Fox** (MS work ’50), **Troy L. Pewe** (PhD ’52), **Jon Cummings** (BS ’52; MS ’56; PhD ‘60) **C. Eric Lindvall** (MS ’58), **Reuben Kachadoorian** (MS ’58), **Phil Burkland** (BA ’59), **Earl Brabb** (PhD ’60), **Manuel G. “Doc” Bonilla** (MS ’60), **Fred A. Schilling** (BA ’62), **Doug Hamilton** (MS ’62; PhD ’84), **Ray Pestrong** (PhD ’65), **Steve Ellen** (BS ’67, PhD ‘71), **John Williams** (MS ’68, PhD ’70), **Tom Holzer** (MS ’66, PhD ’70), **David Pollard** (PhD ’69), **Scott Burns** (MS ’70), **David K. Keefer** (BS ’71, MS ’71, PhD ‘77), **Jim Baker** (BS ’71, MS 76), **George Plafker** (PhD ’72), **Karl Vonderlinden** (PhD ’72), **Marjorie Korringa** (PhD ’72), **Pat Shires** (BS ’72), **Robert W. Fleming** (PhD ’72), **John C. Tinsley** (MS ’72, PhD ’75), **Tim J. Manzagol** (grad studies ’73-’74), **James Rodine** (PhD ’74), **David Hoexter** (MS ’75), **Nick Sitar** (MS ’75; PhD ‘79), **Jeffrey A. Gilman** (MS ’75), **Alexander Soto** (MS ’75), **Richard H. Hazen** (BS ’76), **Douglas M. Yadon** (MSCE ’76), **Sally Widhelm** **Bilodeau** (MS ’76), **Charles H. Trautman** (MS ’76), **Matthew J. Brunengo** (BS ’76, MS ’78); **Kerry Sieh** (PhD ’77), **Gary Holzhausen** (MS ’73, PhD ’78), **Bill Bilodeau** (PhD ’79), **D. Kent McMillan** (PhD ’79), **Patti Sutch** (MS ‘79), **Richard Weiss** (MS ’80), **John T. O’Rourke** (MS ’80), **Horacio Ferriz** (MS ’80, PhD ‘85), **Walter E. Dibble** (PhD ’80), **Roger Greensfelder** (PhD ’81), **Bill Fowler** (MS ’82), **David Cochrane** (MS work 1981-83); **Rex Upp** (PhD ’83), **Lauren Jelks Doyel** (BS ’83), **Betsy Mathieson** (MS ’83), **Dorothy Merritts** (MS ’83), **Richard Iverson** (MS ’80, ‘81, PhD ’84), **David R. Montgomery** (BS ’84), **Scott C. Lindvall** (BS ’84), **Steve Martel** (MS ’84, PhD ‘87), **Tim Hall** (PhD ’84), **Jean Bahr** (MS ’85, PhD ’87), **David T. Schrier** (BS ’85), **Randy Jibson** (PhD ’85), **Linda Bond** (MS ’86), **Susan Forker** (BS, MS), and many others.

 **Joe Poland** (’29), **Larry James** (’40), and **Ray Taber** (’48) were three of the thirteen founding members of the ***California Association of Engineering Geologists*** in Sacramento in 1956, which was renamed the ***Association of Engineering Geologists*** (AEG) in January 1963. **Ed Zeilbauer** (’31) served as the last President of CAEG in 1962, which became AEG under the presidency of Ray Taber (‘48) in Jan 1963.

**Hyde Forbes, Consulting Engineer and Geologist (1921-57)**

 **James Hyde Forbes,** PE (1889-1961) was a native of Tulare who attended Stanford University, receiving his BA in geology and mining engineering in January 1914. He was a devoted protégé of Prof **John Branner** (1850-1922), who founded the geology and mining programs at Stanford. Forbes initially worked for the Spring Valley Water Co in Niles to establish a well field in the Alameda Creek alluvial fan. During the First World War (1917-18) he served as an officer in the Army Corps of Engineers. Shortly after the war he opened a consulting practice in Los Angeles working with hydrologist **A. L. Sonderegger**, PE. In April 1921 he moved his practice to San Francisco, where he was based out of the Humboldt Bank Building until 1957. He consulted on numerous groundwater problems, including cases involving the Los Angeles Bureau of Waterworks & Supply in the early 1920s. He also worked for many years with noted San Francisco consulting hydrologist **Charles H. Lee** (profiled below).

 ***Forbes was the first consulting engineering geologist in California***, but he always referred to himself as “**consulting engineer and geologist**.” He worked on numerous slope stability problems around the SF Bay area in the 1930s and 40s. Some examples include: ***Geological report on Upper and Lower Narrows Dam sites on Yuba River*** in April 1930; “***Geological report on Friant, Fort Miller, and Temperance Flat dam sites on San Joaquin River***” for the State Division of Water Resources (also in 1930); and “***Effect of Niles-Irvington section of the Haywards fault***” in the Bulletin of the Seismological Society of America, 1949 v.39: 243-247. Forbes wrote a landmark article titled “***Landslide Investigation and Correction***” that appeared in the ASCE Transactions in 1947 and received ASCE’s **James Laurie Prize** in 1948.

 Forbes’ clients included Charles H. Lee, Western Pacific Railroad, California-Oregon Power Co., C&H Sugar, Territory of Hawaii, Dept of the Army, Dept of the Navy, the Atomic Energy Commission in Hanford, and the cities of Los Angeles, San Francisco (including the geology of the Broadway Tunnel), Oakland, etc.

Forbes retired in 1957 and moved to Palm Springs. His son **James H. Forbes, Jr.**, was President of **Forbes, Hillendahl and Associates**, an urban planning firm based in Los Angeles. In the late 1950s Forbes Sr. and Jr. collaborated on studies of the groundwater basins beneath the Oxnard Plain. Hyde Forbes, Sr. died of accidental drowning at his home in Palm Springs in Oct 1961.

**Killingsworth, Poland & Smith – Consulting Engineering Geologists (1932-39)**

This was the ***first consulting engineering geology firm in California***, established in Palo Alto around 1932. It was founded by three students of Professor C.F. Tolman: **Cecil C. Kilingsworth**, RG (AB ’29; MA ‘31 Stanford), **Joseph F. Poland**, CEG (AB Geol ’29 Harvard; MA ’35; PhD ‘81 Stanford), and **Ward C. Smith**, RG (AB Geol ’31 Stanford; PhD ’36 Yale). Most of their consultations dealt with developing groundwater supplies across northern California. They had previously worked with Stanford Professor **C.F. Tolman** on similar consulting assignments, across northern and central California.

 **Cecil “Cece” C. Killingsworth**, RG (1909-77) was from southern California and had attended Whittier College before transferring to Stanford in 1926, where he completed his BS (1930) and MS (1932), on *“A report on the underground water supply of Stanford University and vicinity.”* Cece later took a position with an oil company in Los Angeles. In 1956 he patented a gravel filtration system around oil and gas wells and established a family-owned oil and gas business in Kern County while living in the Brentwood section of Los Angeles.

**Joe Poland**, CEG (1908-91) was an instructor in geology at Stanford from 1936-38 and took the U.S. Geological Survey civil service examination in 1938. He was hired as a research geologist by the USGS Regional Geology Branch, and then as research hydrologist between 1956-74, working out of Long Beach and Sacramento. While working in Sacramento in 1957, he was one of the 13 founding members of what became the ***Association of Engineering Geologists*** (AEG). Poland had completed the requirements for a PhD in 1939, but never complted filing for the degree because he departed to accept the USGS position. By the 1970s Poland was recognized as an international authority on hydrogeology and land subsidence, and several oif his colleagues gathered his most notable papers into a single volume and submitted it as a doctoral dissertation to Stanford, which honored him with a PhD in 1980!

**Ward C. Smith**, RG (1906-98) received his BS in geology from Stanford in 1931 and taught geology at Ventura College in 1932-33 as well as Stanford’s summer field camps in 1931, ’32, ’36, and ’37 while working on his Ph.D. at Yale. After completing his doctorate in 1936, he taught geology at Pomona College for two years. In 1938 he joined the Mineral Deposits Branch of the USGS, and in May 1952 assumed leadership of the Survey’s Mojave Borates Project working out of Claremont, which he led until retiring in 1971.

**University of California – Berkeley threadline**

 The **University of California** was chartered on March 23, 1868 as California’s first Land-Grant public institution, which required all male students to receive voluntary military training. The university was originally comprised of the Colleges of Civil Engineering, Mechanics, and Mining Engineering. The civil engineering and mechanics colleges were combined in 1931, and mining engineering was combined with the other engineering disciplines to form the university’s College of Engineering in 1942.

 The Southern Branch of the University of California was established in 1919 in Los Angeles. It was moved to Westwood in 1927 and was re-named the University of California, Los Angeles (UCLA), allowing the flagship campus of the University of California system to increasing be referred to as “California,” the University of California, Berkeley, Cal Berkeley, or U.C. Berkeley.

**The geology program at Berkeley**

 In September 1869 **Joseph LeConte**, NAS (1823-1901) joined the faculty of the new university as a professor of geology and natural history. LeConte had been educated as a physician, but after practicing medicine for three years, became a protégée of Louis Agassiz at Harvard studying geology. After his graduation from Harvard, he accompanied Agassiz on an expedition to explore the Florida Reefs in 1851-52. He taught geology at Franklin College for four years, followed by 12 years on the faculty of the University of South Carolina before moving to Berkeley. He visited Yosemite Valley the following summer (1870) and became fast friends with conservationist **John Muir**, who lived in nearby Martinez. ***LeConte was elected to the National Academy of Sciences in 1874***, the first person in California to be so honored. At Berkeley he published his first textbook, ***Elements of Geology*** in 1877, which remained in print for 17 years and was used by colleges across the United States.

 In 1890 LeConte retired and was succeeded by **Andrew Lawson** (1861-1952) (BA 1883 Toronto; MA 1885; PhD 1888 Johns Hopkins), who was joined by paleontologist **John C. Merriam**, NAS (1869-1945) (BS Geol 1891 Berkeley; PhD 1894 Univ Munich) in 1894, and mineralogist **Arthur S. Eakle** in 1900. One of Lawson’s lasting contributions to engineering geology and geomorphology was his coining of the term “fanglomerate” in 1913, to describe the very coarse deposits he kept finding in upper reaches of alluvial fans across California, which contain subangular blocks that have not been significantly abraded by tumbling down a channel (they are usually deposited by debris flows). These were first described in Lawson’s article ***The Petrographic Designation of Alluvial Fan Formations*** (Univ Calif Pubs, Bulletin of Department of Geological Sciences 7:15; 325-34).

 **Merriam** was appointed to lead the new Department of Paleontology when it was established in 1912 and was elected to the ***National Academy of Sciences*** in 1917, the ***second geology professor from California so honored***. He became head of the National Research Council in 1919 and ascended to the presidency of the Carnegie Institution of Washington in 1920, which he held for 18 years. During that time he fostered an unprecedented program of research in seismology on the Pacific Coast (which is why he’s mentioned here).

 Although initially small, Berkeley’s geology program turned out some of the most influential geologists of the 20th Century. One of the program’s earliest graduates was **Charles Palache**, NAS(1869-1954), who took a BS degree in mining geology in 1891. He became Andrew Lawson’s first graduate student, receiving his PhD in geology in 1894. His graduate work included mapping the “***Geology of the Berkeley Hills***” (which missed identifying the Hayward fault), followed by his more expansive mapping of the San Francisco Peninsula, which was the first work to reveal the presence of the San Andreas Rift (this work was subsequently included in Lawson’s San Francisco Folio for the USGS, released in 1914). In 1902 Palache joined the geology faculty at Harvard, where he remained until retirement, in 1941. He was elected to the ***National Academy of Sciences*** in 1934.

 The university’s first course in seismology was not offered until 1912, by **Elmer F. Davis** and later, by Jesuit Father **James B. Macelwane** (who went onto found the seismology program at St Louis University). In 1925 Lawson asked **Perry Byerly**, NAS (AB 1921; MA 1922, PhD Physics 1924 Berkeley) to join the Berkeley faculty and direct the two seismographic stations. He built up the Berkeley program in seismology and was elected to the ***National Academy of Sciences*** in 1946. By the time he retired in 1965, the **Berkeley Seismographic Station** operated 16 seismograph arrays, more than any other university in the world.

 By 1945 the geology department grew to seven faculty: **Perry Byerly**, **Charles Gilbert**, **Norman E.A. Hinds**, **George Louderback**, **Adolf Pabst**, **Nicholas L. “Tucky” Taliferro**, and **Howell Williams**. In the late 1940s the department attained international reputation when Williams [hired](http://eps.berkeley.edu/) petrologist **Francis Turner** from New Zealand and geophysicist **John Verhoogen** from Belgium. In 1963 the name of the department was changed to “**Geology and Geophysics**.” By 1968 the academic staff had grown to ten faculty in geology, including **Garniss H. Curtis**, PhD, RG (profiled with Ben Lennert, below), **Chuck Meyer**, PhD, RG, **Clyde Wahrhaftig**, PhD, RG, and **Lionel Weiss**, PhD, RG; and four more in geophysics, including **Bruce A. Bolt**, PhD, RG, RGP and **Tom McEvilly**, PhD, RGP.

 In 2001 the department’s name was changed again, to “**Earth and Planetary Science**.” Adding these new fields resulted in further growth, to 21 faculty.

**Engineering geology at Berkeley**

 **Andrew C. Lawson**, NAS (1861-1952) joined the university in 1891 and immediately began building up the fledgling geology and mining program begun by John Leconte. Shortly after the April 1906 San Francisco earthquake, he was named Chairman of the ‘State Earthquake Investigation Commission’ to make a scientific investigation of the earthquake. This work culminated in the publication of the “***The California Earthquake of April 18, 1906. Report of the State Earthquake Investigation Commission***,” commonly referred to as the “Lawson Report.” In 1924 he was elected to the National Academy of Sciences. In 1928 he was named to the Board of Geologists for the design of the ‘Suisun Bay Bridge’ across the Carquinez Straits, between Benicia and Martinez. This board advised the Southern Pacific Railroad on where to locating the bridge across the Carquinez Straits, to avoid crossing the Southampton fault mapped by Lawson and his students. In 1929 Lawson was named to the *External Review Panel to evaluate the San Gabriel Forks Dam* by the Los Angeles county Flood Control District. Later that year the panel concluded that the proposed dam “cannot be constructed without creating a menace to life and property.” They recommended that an “earth and rock fill dam of conservative design” might be successfully employed at the site (between 1933-38 San Gabriel Dam No 1 was constructed as the world’s highest rockfill dam at a site two miles downstream).

 Between 1929-37, Lawson also served as ‘Consulting Geologist’ on the Golden Gate Bridge. In 1934 Willis and Berkeley geology Professor **Andrew Lawson** got into a heated debate about the stability of the serpentine foundation supporting the South Tower of the Golden Gate Bridge. Lawson had been named consulting geologist for the bridge project in the late 1920s and had supervised the initial exploration of the anchor and tower sites in 1929-30, which included six exploratory holes and a plate load test of the South Tower, beneath 65 feet of water, about 1,125 ft off Fort Point. The plate load test employed a 20-inch square steel post, which withstood a normal force of 33 tsf before bearing failure, which was more than double the intentioned structural load. In early 1934 excavations for the south Tower began, and over 60,000 yds3 of rock was removed with aid of explosives. The excavations were carried down to a depth of approximately -100 feet below sea level, to create a suitable socket in the Franciscan Mélange. Additional core borings were carried out at this time, including one hole taken to -259 ft below sea level. Once the foundation socket was excavated, new plate load tests were carried out using 12-inch square columns of wood, loaded with iron ingots on a steel plate. These tests indicated a bearing capacity of 33 tsf, while the towers design load was only 11 tsf. After the caisson was de-watered Willis made a personal inspection of the mélange exposed in the excavation. He felt that the seams of serpentine could serve as planes of weakness that could cause a catastrophic failure of the South Tower. This criticism from such a respected luminary of engineering geology created considerable consternation, but Lawson’s views prevailed because he was project geologist and the Board of Consultants (O.H. Ammann, Charles Derleth, and Leon S. Moisseiff) felt that the margin of safety for bearing capacity (FS = 3) was adequate. The two giants of Bay Area geology never collaborated or served on any review panels afterwards.

 **F. Leslie Ransome**, NAS (1868-1935) received his AB degree in geology in 1893 and his PhD in 1896. He was ***one of the four original civil servant geologists hired by the U.S. Geological Survey*** (Ransome, Mendenhall, Spencer, and Willis). He achieved considerable fame as a USGS economic geologist, based in Washington, DC, and was elected to the ***National Academy of Sciences*** in 1916 (the first Berkeley alumnus so honored, and 8 years before Andrew Lawson). During the last 15 years of his life Ransome served as the principal geologic consultant on an impressive array of engineering projects, including geologic mapping of the Boulder Canyon and Black Canyon Dam sites (1921-23), examination of the St. Francis Dam failure (1928), the design and construction of Hoover Dam (1931-32), and the feasibility studies for the massive Colorado River Aqueduct (1933-35).

 **George D. Louderback** (1874-1957) received his AB in geology from Berkeley in 1896 and began teaching mineralogy in 1897, while working on his PhD, conferred in 1899. He then taught at Nevada-Reno and the Carnegie Institute for six years before returning to Berkeley in 1906 as an assistant professor of geology, remaining on the faculty until his retirement in 1944 (serving as Dean of Letters & Sciences from 1930-39). Louderback was a pioneering figure in applied geology and engineering geology, serving as the first secretary of the **Seismological Society of America** when it was established shortly after the 1906 San Francisco earthquake. He served as SSA president in 1914 and in 1929-35, and as editor of the SSA Bulletin for many years, beginning in 1935 and continuing without compensation, until he died in 1957. Professor Louderback was a member of many investigative boards, including the ***Governor’s Commission to Investigate the Failure of the St. Francis Dam*** in 1928. Some of his memorable contributions to engineering geology include: ***Geologic conditions at the St. Francis Dam site***(1928); ***Geological conditions at Lafayette Dam*** (1930); ***Geologic report on Kennett, Iron Canyon, and table Mountain sites on Sacramento River*** (with F.L. Ransome) in 1933; ***Characteristics of active faults in central Coast Ranges of California with application to the safety of dams*** (1937); ***Characteristics of the Haywards fault*** (1939); ***Faults and earthquakes***(1942); ***Faults and engineering geology*** (1950); and ***Geologic history of San Francisco Bay*** (1951).

 Another early faculty member was **John P. Buwalda** (1886-1954), who received his AB degree from Berkeley in 1912, followed by a PhD in 1915. He taught geology at Yale (1917-21) before returning to Berkeley as part of their faculty from 1921-25. He was the first geologist to recognize the existence of the **Hayward fault** running through the Berkeley campus after mapping foundation excavations for Memorial Stadium, in 1921-22. Buwalda was lured to Caltech in 1925 to development their new Earth Sciences Division, which became the largest geology program in the world by the time he retired in 1947. Buwalda was a major figure in the development of engineering geology in the Western United States, mostly on water supply and public works projects. These included the Colorado River Aqueduct, numerous dams in southern California (including Garvey Reservoir, which was not built according to his recommendations, and abandoned after the Whittier Hills Earthquake in 1987). One of Bulwalda’s last consultations was San Bernardino State College, which the State of California constructed astride the active strand of the San Andreas Fault, over Bulwalda’s vociferous objections.

 In 1972 **Luna Leopold**, PE, RG, NAS (BSCE ’36 Wisconsin, MS Meteorology ’44 UCLA; PhD Geol ’50 Harvard) joined the faculty after stepping down as Chief Hydrologist of the USGS (from 1956-66). He was elected to the National Academy of Sciences in 1968 and recipient of the National Medal of Science in 1991 for his contributions in hydrology and fluvial geomorphology, which influenced engineering and environmental geology.

 In 1982 **William E. “Bill” Dietrich**, NAS (BA Geol ’72 Occidental; MS ’75, PhD ’82 Washington) joined the geology faculty. Trained as a hydrologist and fluvial geomorphologist with Tom Dunne at the University of Washington (who transferred to UCSB in 1995), Bill took engineering courses in channel hydraulics and hydrology, and became an advocate of “quantitative geomorphology,” which sought to validate physical processes through quantitative evaluations and analyses (e.g. he can talk to engineers in their language). Bill made significant contributions to understanding the evolution of colluvial filled bedrock ravines, debris flow triggering mechanisms, and developing new techniques for mapping *and* assessing slope stability in forested watersheds, which have influenced engineering geology practice, world-wide. He was elected to the National Academy of Sciences in 2003.

**Berkeley-trained engineering geologists**

 U.C. Berkeley trained a significant number of engineering geologists who went onto stellar careers. These included: **Leslie Ransome** (BA 1893), **George Louderback** (BA 1896), **Chester Marliave** (BS 1907), **John Buwalda** (BA 1912), **Parker Trask** (PhD ’23), **Ulysses S. Grant IV** (grad work ’26-’27), **Bill Gardner** (BA ’27), **Alfred Livingston** (MS ’29), **Gordon Oakeshott** (MS ’29), **Elmer C. Marliave** (AB ’32), **Burton H. Marliave** (’39), **Dick Merriam** (PhD ’40), **Manuel** **‘Doc’ Bonilla** (BA ’43), **Chuck Welby** (MS ’49),**Cole McClure** (BA ’50), **Roy Hoffman** (BA ’50), **Charles Higgins** (PhD ’50), **Alan O’Neill** (BA ‘51), **Chuck Winterhalder** (BS ’51), **Dick Mills** (BA ’51), **Ed Margason** (BA ’52), **Salem Rice** (MA ’52), **Bob Matthews** (BA ’53), **Burt Slemmons** (PhD ’53), **Don Weaver** (BA ’54), **Marv McCauley** (BA ’54), **George Plafker** (MS ’56), **Frank Kresse** (BA ’56), **Steve Korbay** (BA ’57), **Sandy Hay** (BA ’57; MA ’61), **Tom Rogers** (MA ’57), **Dave Snow** (MS ’57), **Jim Berkland** (BA ’58), **Shell Medall** (BA ’58), **Ernie Solomon** (BA ’59), **Bob Perry** (BA ’61), **Mike Huffman** (BA ’62), **Keith Howard** (MS ’62), **Bud McRae** (BSCE ’62), **Paul Davis** (BA ’63), **Dick Goodman** (PhD ’63), **Tim Hall** (MA ’65), **Charles Van Alstine** (MS ’67); **J.** **Ross Wagner** (BS ’67; PhD ‘78), **Roy Shlemon** (PhD ’67), **Fred Kintzer** (BA ’69), **Tiong J. Liem** (BA, 69), **Marc Seeley** (BA ’69), **John Clague** (MA ’69), **John Cadman** (PhD '70), **Earl W. Hart** (MA ’71), **Gene Kojan** (PhD ’72), **Mark Peterson** (BA ‘73), **Terry Howard** (PhD ’73), **Don McEdwards** (MS ’73; PhD ’79), **Mike Perkins** (MS ’74), **Joel Sturm** (BA ’74), **Dean Ostenaa** (BA ’74), **Gil Lawton** (BA ’75), **Patrick Hubbard** (BA ’76), **Paul Studemeister** (BA ’77), **Pam Irvine** (MS ’77), **James Lienkaemper** (MS ’77), **Diane Wolfgram** (PhD ’77), **Nancy Tannaci** **Bice** (BA ’79), **Gerry Wieczorek** (PhD ’78), **John Wakabayashi** (BA ’80), **Jon Y. Kaneshiro** (BA ’80), **Eric A. “Rick” Swanson** (MS ’80), **Neil Thomsen** (MS ’81), **Ted Sayre** (BA ’81), **Frank Groffie** (BA ’82), **Dave Rogers** (MS ’79; PhD ’82), **Bill Lettis** (PhD ’82), **John Sturman** (BA ’84), **Deni Chambers** (BA ’85; MS ‘88), **Janet Sowers** (PhD ’85), **Eric Swenson** (BA ’87), **Chip Gribble** (BS ’87), **Steven Reneau** (PhD ’88), **Mark Caruso** (BA ‘89), **David R. Montgomery** (PhD ’91), **Victor S. Romero** (MS ’91), **Lucas Goldstein** (BA ’94, MA ’95), **Vincent J. Romano** (BS 2006), **Margaret Clair Parks** (PhD 2019), and many more.

**The mineral technology and geological engineering programs at Berkeley**

In 1947 **Edward H. Wisser** joined the Berkeley faculty as Professor of Mineral Exploration in the Department of Mineral Technology. He was joined by **Parker Trask** in 1951, and **Paul Witherspoon** in 1957. In 1958 Trask began a geological engineering program, which was later absorbed into the geotechnical engineering program of civil engineering, after Trask died in 1961and Wisser retired in 1963.

Some of the mineral engineering and mineral technology programs’ graduates who made significant contributions to engineering geology and geotechnical engineering included: **Charles Palache** (1891), **Joseph N. Leconte** (1891), **Eugene C. Larue** (1906), **Chester Marliave** (1907), **Alfred Livingston** (’24), **Gordon Oakeshott** (’28), **Burton H. Marliave** (’39), **Chuck Welby** (’48), **Chuck Winterhalder** (’51), **Roger S. Rhodes** (’54), **Burt Sleemons** (‘56), **Jacob Bear** (’60), **Keith A. Howard** (’61), **Michael S. King** (’61), **Richard Appuhn** (’63), **Richard E. Goodman** (’63), **David T. Snow** (’65), and **Rex Upp** (’66).

**Parker D. Trask** **(Berkeley faculty 1951-61)**

**Parker Davies Trask** (1899-1961) was one of the most eclectic American geologists of the 20th Century. He graduated from the University of Texas at the age of 18 in 1917, majoring in mathematics, with a minor in paleontology. The following year his family moved to California and he enrolled in the University of California Medical School in San Francisco. After two years of med school he dropped out to [pursue his fascination with paleontology, enrolling in the graduate program at Berkeley, where he examined the Briones Formation in the Berkeley Hills for his master’s thesis, awarded in 1920. He went onto complete his PhD in geology in 1923, mapping the ***Geology of the Point Sur Quadrangle***, under the supervision of Andrew Lawson.

In 1924 he was awarded a traveling fellowship that to him to northern and central Europe, Greece, and North Africa, studying mineral deposits and acquiring linguistic talents that would serve him well in the years to come. He then spent two years as an instructor of geology at Yale, followed by five years as a research associate for the American Petroleum Institute (1926-31), which culminated in his book Origin and Environment of Source Beds of Petroleum, released in 1932. He then spent 15 years (1931-46) with the USGS, which included three years’ service with the Office of Naval Intelligence during World War II, predicting subsurface conditions for submarines in the oceans surrounding Japan. In 1946 he joined the geology faculty at the University of Wisconsin but departed the following year returning to the San Francisco Bay Area as Supervising Geologist of the State Division of Mines. His personality didn’t agree with those of his supervisors and a year later (1948) he moved to the State Division of Bay Toll Crossings, where he played an important role in characterizing the engineering geology of the San Francisco Bay region, until 1951. The latter positions were both located in the Ferry Building in San Francisco.

His most widely cited work was as editor-in-chief of “***Applied Sedimentation***” prepared by the Committee on Sedimentation of the National Research Council in 1947-50, which included contributions by Professors Karl Terzaghi of Harvard, Heinrich Ries of Cornell, Ralph E. Grim of Illinois, Arthur Cleaves of Washington University-St Louis, Thomas Middlebrooks, Gail Hatheway and Willard J. Turnbull of the Army Corps of Engineers, Roger Rhoades (Chief Geologist) and Arthur R. Golze (Director) of the Bureau of Reclamation, and David J. Varnes of the USGS. This 707-page tome is one of the most oft-cited references in engineering geology.

#  In the late summer of 1951 Trask joined the faculty in Mineral Technology at Cal Berkeley, where he led Berkeley’s program focused on training engineering geologists for careers in industry and academia. He also taught a graduate course in engineering geology for civil engineering students. During the 1950s he took a leading role in the establishing the professional literature in engineering geology and served as editor of the *Engineering Geology Case Histories No. 1* (1957); *No. 2* (1958), *No. 3* (1959) and co-editor of *No. 4* (issued posthumously in 1964). Trask took the title Professor of Geological Engineering in 1956 and directed the mineral technology program until his death on Nov 12, 1961. His last consulting project was “*Engineering geology of the proposed linear accelerator Sand Hill site, Stanford University, California*.”

**Lecturers in geological engineering (1961-71)**

When Parker Trask died in November 1961 it left the future of the fledgling geological engineering program in doubt. In a bold move, Mineral Technology department chair Ralph Hultman hired three of the best engineering geologists in the nation, each on a quarter-time appointment: **Tom Lang**, **Roger Rhoades**, and **Tommy Thompson**.Lang (1909-94) had pioneered the use of rockbolt rock reinforcement techniques for the Snowy Mountains Hydroelectric Authority in southeastern Australia before imigrating to San Francisco in 1959 to manage Bechtel’s Hydroelcrtic Power Division. Rhoades (1905-72) had served as Chief Geologist of the Tennessee Valley Authority and of the US Bureau of Reclamation prior to retiring from federal service. Thomas F. Thompson (1906-76) had worked for the Army Corps of Engineers, serving as Chief of the Geology Section working on the proposed Panama Canal expansion in the late 1940s. After retiring from the Corps, he consulted on numerous project s for the Ralph M. Parsons Co., Kaiser Engineers, Metropolitan Water District, and the Atomic Energy Commission.

In the fall of 1962, the department brought in engineering geologist **Daniel G. Moye** (1920-75) (BS Geol ‘41 Univ Sydney), former Head of the Engineering Geology Branch of the Snowy Mountains Hydroelectric Authority in Australia, as a professional fellow for one year. He taught courses on applied engineering geology and the newly emerging specialty of rock mechanics. During this final year of Goodman’s academic training Moye became his professional mentor in applied rock mechanics and engineering geology (in January 1975 Dan Moye, his wife and daughter were tragically killed in an automobile accident in their native Australia).

The new GE program also invited speakers as guest lecturers, such as retired Corps of Engineers engineering geologist **Ray C. Treasher** (1898-1967) had an intimate working knowledge of the late Quaternary stratigraphy of the San Francisco Bay area from working on many of the dredging, filling, pipeline, and bridge crossings. Lang continued lecturing part-time on Saturdays for the next nine years (until 1971). Through Moye’s and Lang’s professional connections, numerous field trips were taken to hydroelectric projects in the Sierras that were under construction. These visiting lecturers and adjuncts, combined with Dick Goodman (who came aboard full-time in the fall of 1963) met the demands of the program, then housed in the Hearst Mining Building.

**Richard E. Goodman (Berkeley faculty 1963-94)**

**Richard E. Goodman**, PhD, NAE (1935-) completed undergraduate work in geology at Cornell (BA 1955), followed by a master’s in engineering science in 1958, working with aerial photography pioneer Prof. Don Belcher. Dick came to Berkeley to work on a PhD in mineral engineering with Prof. Parker Trask in 1959, but Trask died in November 1961. Goodman said he received a “battlefield commission” when, from his hospital bed, Trask asked him to take over his engineering geology class for civil engineers. Dick ended up completing his PhD under **H. Bolton Seed** in civil engineering in 1963 and was promptly appointed to Trask’s position. His thesis work dealt with earthquake-induced displacements in sand embankments due to liquefaction, a theme uncannily similar to that proposed by Illinois Professor Nathan Newmark a few months after touring Berkeley and being briefed on Goodman’s research.

Upon formally joining the faculty Dick began championing Berkeley’s geological engineering program, publishing timely articles about the application of geological engineering to civil works, such as the Baldwin Hills Reservoir failure in December 1963. The geological engineering program (Dick Goodman and Paul Witherspoon) was soon absorbed into the geotechnical engineering program in the Department of Civil Engineering and moved to Davis Hall when it opened in 1968. With Harry Seed stepping in the department chair, civil engineering decided to make engineering geology a required course for their undergraduates in 1967.

Dick had hoped to co-author a book on geological engineering with Dan Moye and Tor Brekke, using Moye’s lecture notes as the original catalyst. Dick began writing in earnest during his Guggenheim Fellowship to the Royal School of Mines in 1973, where he worked with Evert Hoek, John Boyd, and John Bray. Moye’s tragic death in January 1975 precluded his involvement with the project. Dick’s textbook was released in June 1976, titled “***Methods of Geological Engineering in Discontinuous Rocks***,” and dedicated to Dan Moye. This was followed in 1980 by “***Introduction to Rock Mechanics***” (with a second edition in 1989), followed by “***Block Theory and its Application to Rock Engineering***” (with Shi Gen-hua) in 1984, “***Engineering Geology: rock in engineering construction***” in 1993, and “***Karl Terzaghi: The Engineer as Artist***” in 1998. Dick was elected to the ***National Academy of Engineering*** (NAE) in 1991, and served as ICE’s ***Rankine Lecturer*** in 1995, Norwegian Geotechnical Institute’s ***Terzaghi Fellow*** for 1995/1996, the Los Angeles ASCE Section’s ***Queen Mary Lecturer*** in 1997, the ***Sowers Lecturer*** in 2000, ASCE’s ***Civil Engineering History and Heritage Award*** in 2000, ASCE ***Seed Lecturer*** in 2001, the ***Kenneth L. Lee Lecturer*** on the Queen Mary in 2010, ***Keynote Speaker*** at the 2013 GeoCongress, and the ***G. A. Leonards Lecturer*** in 2015, and the first USSD Legacy Lecturer in 2017.

Prominent professors and consultants with whom Dick worked closely included **Don Belcher,** of Cornell, **Harry Seed** at Berkeley, **Dan Moye** from Australia, **Tom Lang** of Leeds Hill & Jewett, **Roger Rhoades** from the TVA and Bureau of Reclamation, **Tommy Thompson** from the Army Corps of Engineers**, Pierre Londe** of Coyne & Bellier, **Sid Green** of Terra Tek, **Evert Hoek**, **John Bray** and **E. Ted Brown** at Imperial College, **Fred Kulhawy** at Cornell, **Wolfgang Roth** and **Art Darrow** of Dames & Moore, **Gilles Bureau** ofWoodward Clyde, **Larry James** oftheCalifornia Dept of Water Resources, **Ralph Peck** and **Don Deere** from the University of Illinois, **Neville Cook** from Berkeley’s mining program, **Dale Marcum**, **Bill Cotton** and **Pat Shires** of Cotton-Shires, and **Brian Greene** of the Corps of Engineers. Dick also enjoyed affable relations with just about everyone working in the rock mechanics field between the late 1960s and early 1990s.

Some of his notable students included: **Hans Ewoldsen**, **Richard Appuhn, Yuzo Ohnishi, Francois Heuze, Charles Van Alstine, Gilles J. Bureau, Quentin Gorton, Rudy de la Cruz, Ashraf Mahtab, Jacques Dubois, Alain de Rouvray, John Cadman, Jeff Dunn, Dick Thorpe, P.N. Sundaram, Paul Visca, Gerry Wieczorek, Rudy Sancio, Sr., Marc Hittinger, J. David Rogers, Bernard Amadei, Duncan Wyllie, Rick Nolting, Tarcisio Celestino, Tom Brunsing, Lap Yan Chan, Joe Ratigan, Marie Schauer, Nancy Tannaci, Doug Blankenship, Bill Boyle, Dale Marcum,** **Joel Kuszmaul, Anders Bro, Shi Gen-hua, Ron Yeung, Jesse Yow, John Tinucci, Bhaskar Thapa, Rick Sisson, Derek Ellsworth, Matt Mauldon, Yossef Hatzor, Eric Lindquist**, **Ed Medley**, and **Scott Kieffer.**

**Paul Witherspoon (Berkeley faculty 1957-77)**

**Paul A. Witherspoon**, PhD, NAE (1919-2012) (BS PetE ’41 Pittsburgh; MS ’51 Kansas; PhD ’57 Illinois) came to Berkeley as a Professor of Petroleum Engineering in the Mineral Technology Department in 1957. In 1965 Paul was later absorbed into the geological engineering program within civil engineering. He served as the group’s expert in hydrogeology and, in 1971, began working with the Energy and Environment Program established at Lawrence Berkeley Laboratory (LBL). In 1977 he became Director of the newly formed Earth Sciences Group at LBL, where he championed research on nuclear waste isolation, among other subjects. In 1989 he was elected to the ***National Academy of Engineering*** shortly before retiring from LBL. He continued working as one of the principal consultants to the Department of Energy on their Yucca Mountain Project at the Nevada Test Site. Some of his more notable students included Professors **David T. Snow**, **R.** **Allen Freeze**, **Shlomo Neuman**, **Donald Helm, Iraj Javendel**, **Don McEdwards, T.N. ‘Nari’ Narasimhan**, and **Y.N.T. Maini**.

**Tor L. Brekke (Berkeley faculty 1970-93)**

 **Tor Langfeldt Brekke**, DIng, Lic.Tech. (1934-2009) completed his master’s degree in mining engineering at the Norwegian Institute of Technology in Trondheim in 1958, then spent three years in the Norwegian Army Engineers. In 1961 he returned to Trondheim and completed his Dr Ingenior degree in geological engineering in 1963, working on methods of abating the impacts swelling clay seams in tunnels, under Prof. R. Selmer-Olsen. He then served as a senior lecturer at the Norwegian Institute of Technology from 1963-69, which included a six-month stint as visiting research associate at Berkeley in 1967. In 1970 he joined the Berkeley faculty in geological engineering, after turning down a similar offer from the University of Illinois. He was promoted to full professor in 1976 and taught the basic engineering geology course, intro to geological engineering, geological engineering of underground openings, and co-taught a course with P.K. Mehta on concrete aggregates. He chaired the ***U.S. Committee on Tunneling Technology*** for many years in the late 1970s and early 1980s. He also chaired the ***Expert Panel*** of the *NRC’s* ***Nuclear Waste Technical Review Board*. Tor** served on the board of consultants of every major tunneling job in the United States from about 1977 until a few years before his death, in 2009. Some of his notable graduate students included: **Norbert Tracy**, **Terry Howard**, **Gregg Korbin, Randy Essex, Ian Brown, Peter Lukins, Bob McManus, Brenda Myers-Bohlke, Glenn Boyce, Victor Romero**, **Mike McRae**, and several others.

**The civil engineering program at Berkeley**

 Berkeley’s civil and irrigation engineering programs garnered considerable respect in the late 19th and earth 20th Century because of their pioneering role in irrigation work, made possible by passage of the Wright Act by the state legislature in 1884. The university’s first doctorate degree was awarded to civil engineer **Marsden Manson** (1850-1931) (BSE 1870 VMI) in 1880 for his research work studying the transport of hydraulic mining debris down the Feather and Sacramento Rivers from the Sierras. Manson later served as City Engineer for San Francisco and was the moving force behind that city’s securing of the water rights to the Tuolumne River, resulting in the Hetch Hetchy Project.

 In the early 20th Century, the San Francisco earthquake and fires, the provision of water supplies for San Francisco and Los Angeles, dominated municipal and statewide expenditures. Between 1907-1938 California suffered through some of the most devastating floods, which impacted much of the civil infrastructure that had recently been built. After the First World War California took a leading role in transportation and water resources engineering, and the rapid development of dams, aqueducts, highways, bridges, and port facilities combined to make California the most diverse and challenging state for civil works construction and infrastructure development.

 Berkeley Civil Engineering Dean **Professor Charles Derleth (**BS 1894 CCNY; CE degree 1896 Columbia) began teaching at Berkeley in 1903. He taught the first course on foundation engineering in the San Francisco Bay Area, summarized in “***Notes on Foundations and Masonry Structures***” for Senior Courses in Civil Engineering, dated October 1921.

A few months later the San Francisco Section of ASCE set up a **Subsoil Committee** to investigate and report on “***Foundation problems in the Filled-in Area of San Francisco***.” The committee made regular reports at the b-monthly meetings of the San Francisco Section, and issued a report dated February 20, 1923. One of the key members of the ASCE SF Section Subsoil Committee was San Francisco structural engineer **Leon H. Nishkian** (BSCE ’06 Berkeley). Between 1929-31 his committee compiled an impressive 107 page document titled “***Subsidence and the foundation problem in San Francisco.***” The volume was edited by **George F. Whitworth** (whose May 1924 senior thesis at Berkeley under Professor Derleth was titled “***The Subsoil Conditions in the Filled-In Districts of San Francisco***”).

The Subsidence and Foundation Problems of San Francisco volume was released in September 1932. It contained 25 plates (several in color), including every historic map of San Francisco (to 1775), extensive records of the City’s seawalls, ground subsidence isopleth maps, and the logs of every soil boring drilled in the city up thru 1931. It also contained quotes from Karl Terzaghi’s article “*The Science of Foundations, Its Present and Future,*” which appeared in the ASCE Proceedings in 1927.

The 1932 compilation figured prominently in the teaching at Cal Berkeley up through 1946, when **Arnie Olitt**, **Ned Clyde**, and **Dick Woodward** began lecturing on soil mechanics at Berkeley, prior to starting their own form in January 1950 (described below). In 1950 Professor **Harmer E. Davis** and **Dick Woodward** collaborated on a laboratory manual titled ***Some laboratory studies of factors pertaining to the bearing capacity of soils***, published by Berkeley’s Institute of Transportation and Traffic Engineering ITEE). This was based on a paper of the same title that the two men had presented at the 1949 annual meeting of the Highway Research Board (HRB).

**Berkeley geotechnical engineering program** (under construction)

**H. Bolton Seed**, PhD, NAE (1924-89) was the first tenure track faculty member hired by Berkeley specifically to teach soil mechanics and foundation engineering; in the fall of 1950 (he was elected to NAE in 1970). **Clarence K. Chan**, PE (BSCE ’52; MS ’54 Berkeley) joined the program as a research engineer in 1956, later becoming a lecturer. **James K Mitchell**, PhD, GE, NAE, NAS served as a professor from 1958-93 (elected to NAE in 1976 and the NAS in 1998), **J. Michael Duncan**, PhD, PE, NAE as a professor from 1965-84 (elected to NAE in 1985), **William N. Houston**, PhD, PE, PLS as a professor from 1968-85, when he moved to Arizona State, **John Lysmer**, PhD (1931-99) as a professor from 1965-91, **Nicholas Sitar** PhD, PEng, as a professor, beginning in 1981, **Patrick C. Lucia**, PhD, GE as a lecturer in 1984-86, **Raymond B. Seed**, PhD was a professor between 1987-2017, **Jonathan D. Bray**, PhD, PE, NAE as a professor beginning in 1993, **Mike Riemer**, PhD as adjunct associate professor beginning in 1993, **J. David Rogers**, PhD, PE, CEG, CHG as a lecturer from 1994-2001, **Norman A. Abrahamson**, PhD, PGP, NAE as a lecturer from 1996 onward, **Juan Pestana**, PhD, PE as a professor between 1994-2015, and **Steve Glaser** PhD as a professor of rock mechanics, beginning in 1997. **Mike George**, PhD, PE taught engineering geology from 2011-15.

A few Berkeley faculty enjoyed joint appointments with the geotechnical program over the years. These included Professors **Ben C. Gerwick**, Jr., PE, SE, NAE (1919-2006) from construction management; **Bruce A. Bolt**, PhD, RG, RGP, NAE (1930-2005) Director of Berkeley’s Seismographic Laboratory from 1963-93, **Carl L. Monismith**, PE, NAE of transportation engineering (pavement design), and **Robert G. Bea**, PhD, SE, GE, NAE from construction management.

**Charles H. Lee threadline**

**Charles H. Lee Consulting Engineer (1921-60); Pacific Hydrologic Laboratory (1926-60)**

 **Charles Hamilton Lee**, PE (1883-1967) graduated from U.C. Berkeley’s engineering program in 1905 and went to work for the U.S. Geological Survey as a hydrologist. He made the first credible studies of groundwater resources of San Diego County. In 1906 he was hired by William Mulholland of the City of Los Angeles Bureau of Waterworks & Supply to assess the water resources of the Owens River watershed, writing a comprehensive report that was published as USGS Water Supply Paper 294, and included as an appendix to the final report on the Los Angeles Aqueduct (published in 1916). He became Assistant Engineer for the Los Angeles Aqueduct (Owens River), with primary responsibility for the design of the various embankment dams appurtenant to that project (built on force account by city crews).

 It was while working on the Los Angeles Aqueduct in 1912 that he began a life-long association with **Karl Terzaghi** (1883-1963), an Austrian engineer of the same age (29) who was visiting the United States to view its monumental construction projects, before the First World War. Terzaghi became the father of soil mechanics and foundation engineering, teaching at Robert College in Istanbul (1919-25), where he authored the textbook *Erdbaumechanik* in 1925 and *Ingenieurgeologie* in 1929 (with K. A. Redlich and R. Kampe).

 Lee left the City’s employ in 1912 to work for the State Conservation Commission, investigating water resources in San Diego County (along with geologist **A. J. Ellis**), followed by four years in private practice in Los Angeles (beginning in April 1913), consulting in irrigation, public water supply, and developing hydroelectric power.  During the First World War (1917-19) Lee served as an Army Engineer officer in France, rising to the rank of captain. After the war he served as President of the California State Water Commission, and later as Chief of Division of Water Rights (1919-1921), which proved useful in his subsequent consultations as an expert witness on hydrology issues.

 In 1921 Lee moved to Berkeley and opened an office in San Francisco specializing in sanitation and water supply consultations. He also taught courses in water supply engineering at Berkeley in 1923. During the early 1920s he was regularly engaged by the City of Los Angeles as their expert witness in the many lawsuits involving matters of hydrology in the Owens Valley, where the city had purchased water rights along the Owens River.

 In March 1928 the St. Francis Dam failed and the City of Los Angeles employed Lee as their expert in the defense of numerous wrongful deaths lawsuits brought by the relatives of 450 odd victims. Given the volume of work in Los Angeles, Lee maintained a separate “satellite” office in Los Angeles throughout the 1920s. Other clients included the City of San Francisco Water Department and the East Bay Municipal Utility District, developing the resources of the Mokelumne River. He also worked for the State Department of Public Works in connection with the proposed saltwater barrier in Upper San Francisco Bay in the late 1920s-early 1930s.

 In 1926 Lee established the **Pacific Hydrologic Laboratory**, which came to include the **first soils engineering laboratory on the West Coast**. Lee was the first engineer in California to offer consultations in the emerging field of soils and foundation engineering, building on the increasing notoriety of Terzaghi, who lectured at MIT in 1925-29, and then, at Harvard between 1938-56 (Terzaghi also corresponded with R.V. Labarre and Fred Converse in Los Angeles during the 1930s). Lee’s appreciation of seismic hazards and associated geohazards are evident in his writings of the period, such as: “*The future development of the metropolitan area surrounding San Francisco Bay**,*” published in the Bulletin of the Seismological Society of America in 1926. ***In 1932 Lee pubished the first articles on modern soil mechanics by a California practitioner***, titled “***Getting Down to Earth.***” These appeared in AGC’s *Pacific Constructor* on November 15 and December 1, 1932. From 1936-1939 Lee served as Chief of Water Supply and Sanitation for the Golden Gate International Exposition on Treasure Island. Other soil engineering work included slide repairs, foundation engineering, tunnels, and earth dams. Lee received considerable notoriety when he was awarded the 1939 Norman Medal of ASCE for his research on materials for embankment dams.

 Lee’s work files (through 1955) are maintained by the University of California Water Resources Center Archives (in Riverside). His pioneering work on predicting long term settlement and risk from earthquakes to the hydraulic fill comprising Treasure Island in San Francisco Bay proved remarkably accurate and prophetic. Increasingly petulant with age (he refused to pay employees for vacation or sick time), he died in his Berkeley home at the age of 84 on May 4, 1967.

**Pacific Hydrology Laboratory (1926-1960)**

 **Charles Hamilton Lee**, PE (1883-1967) graduated from U.C. Berkeley in 1905 and went to work for the U.S. Geological Survey as a hydrologist. Lee made the first credible studies of groundwater resources of San Diego County. In 1906 he was hired by William Mulholland of the Los Angeles Bureau of Waterworks & Suppply to assess the water resources of the Owens River watershed, writing a comprehensive report that was published as U.S.G.S. Water Supply Paper 294, which was an appendix to the final report on the Los Angeles Aqueduct (Board of Public Service Commissioners, 1916). While working on the aqueduct in 1912 he began a life-long association with Karl Terzaghi (1883-1963), who visited the aqueduct to view its construction. Terzaghi went on to become the father of soil mechanics and foundation engineering. Lee left the City’s employment after completing construction of the earthen dams associated with the aqueduct in 1916.

 In 1919 Lee opened up a consulting office in Los Angeles to compliment another he had in San Francisco, consulting mostly in the field of hydrology and water resources. He was regularly engaged by the City as their expert witness in the many lawsuits involving matters of hydrology in the Owens Valley and the St. Francis Dam failure. In 1926 he established the **Pacific Hydrologic Laboratory**, ***the first soils engineering laboratory on the West Coast***. Lee was also the first engineer in California to make consultations in the emerging field of soil mechanics, building on the increasing notoriety of Terzaghi, who held a temporary position at MIT in 1925-29, and later, at Harvard University from 1938-56. Lee’s job files are maintained by the University of California Water Resources Center Archives at U.C. Riverside. Lee’s pioneering work on predicting long term settlement and risk from earthquakes to the hydraulic fill comprising Treasure Island in San Francisco Bay proved remarkably accurate and prophetic. He continued working for the City of Los Angeles and the Metropolitan Water District into the 1950s. Increasingly cantankerous with age (he refused to pay employees for vacation or sick time), he died in his Berkeley home at the age of 84 on May 4, 1967.

**Lee and Praszker (1960-1996)**

 A partnership between **Charles H. Lee** (1883-1967) and **Michael Praszker** (1917-99) was formed around 1960. Of Polish birth and heritage, Michael Praszker served in the Royal Air Force during WWII and after the war earned a degree in applied mathematics from Imperial College in London. He immigrated to California in 1950 and earned a second bachelor’s degree in civil engineering from Cal Berkeley in 1953. He briefly worked as a structural engineer for PG&E before joining Charles H. Lee Consulting Engineers in early 1954. Praszker was registered as RCE 10641 in July 1956 and became Lee’s junior partner in 1960, when Lee was 77 and Praszker was 43. Both men had colorful reputations for becoming increasingly cantankerous with age.

 Lee and Praszker’s office was originally at 58 Sutter Street in San Francisco. After the death of Charles Lee in 1967, Praszker moved the office 147 Natomas Street, in a former city fire station. Praszker abandoned much of Charles Lee’s groundwater hydrology clients, preferring to concentrate on foundation engineering for high-rise buildings, bridges, and large industrial projects, as well as earth embankments and landslides. Praszker lived in Marin County and served as a Marin County Planning Commissioner in the 1960s.

 Mike Praszker liked to brag that he and Charles Lee “*wrote the book on Bay Mud*,” referring to Lee’s pioneering work on predicting settlements on Treasure Island in the 1930s, and culminating with their article “*Bay mud developments and related* ***structural foundations***“ in the seminal volume “*Geologic and Engineering Aspects of San Francisco Bay Fill*,” published by the California Division of Mines & Geology as Special Report 97 in 1969. Much of Charles Lee’s professional work is contained in the C.H. Lee Collection of the University of California Water Resources Center Archives at U.C. Rverside.

 **Rich Rodgers**, GE served as the firm’s senior associate for many years until 1992, when Mike Praszker was diagnosed with Alzheimer’s and retired. The firm was dissolved in 1996, and Praszker died in 1999. Some notable engineers who worked for Lee and/or Lee & Praszker included: **Jack W. Rolston**, PE (1953), **Arthur T. Knutson,** PE, **Ben J. Lennert,** PE, **Richard Appuhn**, PE, CEG (1963-67), **J. P. Singh** (1965), **Will A. Thomas**, **Don Hillebrandt**, PE, **Richard Rodgers**, PE (later Treadwell & Rollo), **Michael F. Majchrzak**, GE (BSCE ’75 Loyola Marymount; MS ’77 Stanford; onto Kleinfelder), **John Gouchon** (Treadwell & Rollo), **Paul Lai**, GE (Berlogar), **Craig Shields**, GE (Rockridge Geotechnical), **Ed Becker** PhD, GE (left the firm in 1969 to pursue his PhD at Berkeley), **John Hovland**, PhD, GE (PhD ’70 Berkeley; became Chief Geotech Eng’r of PG&E), **David T. Hsu,** GE (became Senior Geotech Eng’r for City of Los Angeles), **John M. Raney**, GE **(**MSCE ’73 Berkeley; owner of Raney Geotechnical of Sacramento), **Chuck Graves**, **Tom A. Tobin**, GE (BSCE ’78; MS ’79 Berkeley), **Barry Milstone** GE (1980-83), and many others.

**Derivative firms of Lee & Praszker**

**Foundation Engineers** was founded by Jack Rolston in Tarzana, California in 1960, after working for the California Bay Toll Crossings Commission and Los Angeles District of the Corps of Engineers (profiled in the southern California threadline).

**Arthur T. Knutson,** GE (1913-2002) went to work for Marin County Public Works in early 1960s, thru the mid-1970s. In mid-1970s he opened his own consulting firm, **Arthur T. Knutson, Inc**. based in Novato.

**Lennert & Associates (1963-92)**

 **Ben J. Lennert**, GE (1924-2002) (BSCE ’50 Berkeley) was a consulting soils and foundation engineer based in the East Bay. He worked for Lee & Praszker for more than 10 years when he had a disagreement with Mike Praszker and decided to start his own consultancy around 1963-64. The firm was based out of Oakland, then out of his home in Berkeley (1970s), and he moved to the Napa Valley in 1979, where he continued working out of that home until he retired and moved to Marina (next to Monterey) in 1992. He passed away in 2002.

 One of Lennert’s notable contributions was his early recognition of asesimic creep of the Hayward fault at Berkeley’s Memorial Stadium, working with USGS engineering geologist **Dorothy Radbruch-Hall**, CEG. This effort was memorialized in ***Tectonic creep in the Hayward fault zone, California*** (USGS Circular 515), released in 1966. After this Lennert did a lot of consulting work for the University of California, Berkeley and the Lawrence Berkeley National Laboratory (LBL), often working with Campus Engineer **John Shively** in the early 1970s. The ***Lennert Aquifer*** in the Moraga Formation volcanics beneath LBL is named after him.

 Lennert frequently collaborated with Berkeley Geology Professor **Garniss H. Curtis**, PhD, RG(1919-2012) as a consultant. Curtis grew up in San Rafael and received his BS in mining engineering from Berkeley in 1942. He then worked for Christmas Copper and Shell Oil before returning to Berkeley in 1949 to work on a doctorate in geology, which he completed in 1951. He then joined Berkeley’s geology faculty, working on volcanism. Nine years later (1960) he and geophysics colleague **Jack Everden** established **Berkeley’s Geochronology Center**, which led the world in K/Ar age dating. Lennert and Curtis also engaged in numerous studies evaluating aseismic creep of the Hayward fault in the Berkeley Hills, which they published between 1980-85. Curtis died in Orinda on Dec 19, 2012 at age 93.

**Donald Hillebrandt & Associates** was founded by Donald H. Hillebrandt in 1975 (described in Lowney-Kaldveer threadline).

**John H. Raney** founded Raney & Associates in Sacramento (described in Sacramento area firms threadline)

**John H. Hovland**, GE (PhD ’70 Berkeley) went onto became Chief Geotechnical Engineer of PG&E in San Francisco in the mid-1970s thru the 1980s. He occasionally consulted on parcels in the Claremont Canyon area, not far from where he lived in the Berkeley Hills.

**Milstone Geotechnical** **(1990-present)**

Milstone Geotechnical was founded in 1990 by **Barry Milstone**, GE (BSCE ’80 UNH; MS ’85 VPI) in Los Gatos (after working for Cotton-Shires from 1985-90). For many years he used **Tim J. Manzagol**, CEG (BS Geol ’73 Michigan Tech) of Applied Earth Science Consultants in Redwood City as his consulting engineering geologist.

**Rockridge Geotechnical** was founded by **Craig Shields**, GEin 2006 (described in Harding Lawson threadline).

**Woodward-Clyde Consultants threadline** (in Berkeley thread)

**Woodward, Clyde & Associates (1950-59); Woodward-Clyde-Sherard & Associates (1959- 70); Woodward-Lundgren & Associates (1970-78); Woodward Clyde Consultants (1978-97); URS-Greiner Woodward Clyde (1997-2014); AECOM (2014-present)**

 The firm was established in January 1950 in Oakland as **ANDCO**, using the first initials of the first names of the three partners: **Arnold Olitt** (1913-1993), **Ned P. Clyde** (1920-1999), and **Richard J. “Dick” Woodward, Jr.** (1907–1998), each having contributed $50 to capitalize the new firm. Woodward was a native of Pueblo, Colorado who attended Colorado College in Colorado Springs, receiving his BS degree in geological engineering in 1930, about eight months after the Great Depression began. Unable to find employment, he worked in his father’s grocery store in Pueblo for about eight years until he found a higher-paying job at a warehouse in Laramie, Wyoming. This experience led to a position at Mare Island Naval Shipyard on the eve of the Second World War (1940).

 During the war **Arnold Olitt** (BSCE ’44 Berkeley) began teaching extension courses for U.C. Berkeley to Navy personnel at Mare Island Naval Shipyard, where Dick Woodward was one of his students. Olitt encouraged Dick to pursue a graduate degree in civil engineering at Berkeley, so Dick enrolled in Berkeley’s master’s program in January 1946. There he met **Ned Clyde**, who had recently completed his master’s degree and was teaching soil mechanics principles, mostly applied to pavement design. **Clyde** (BSCE ’42 Utah State; MS ’45 Berkeley) was the son of **George Dewey Clyde** (BSCE ’20 Utah State, MS ’23 Berkeley), Dean of Engineering at Utah State in Logan, who also served as two-term governor of Utah (1957-65). Ned matriculated through ROTC and the CE program at Utah State between 1938-42, receiving his commission as a Second Lieutenant in the Army Corps of Engineers in June 1942, and rising to the rank of Captain by January 1944. Just before his unit was deployed overseas Ned was medically discharged for acute asthma. Not wanting to return to Logan during the war (when all the other men were away fighting), he decided to attend Cal Berkeley, his father’s alma mater, which was a life-long aspiration (following in his father’s footsteps). He completed his masters in 1944-45 and began teaching courses at Berkeley in the fall of 1945, about the time Dick Woodward arrived as a middle aged grad student. Dick began lecturing in the fall of 1946, while working on his master’s degree, so he, Ned, and Arnie Olitt soon found themselves teaching together, between 1945-50 (Olitttaught structures courses).

 Three of their students would later figure prominently in the growth of Woodward-Clyde Consultants: **Jim Sherard** (’46), **Doug Moorhouse** (’50), and **Ray Lundgren** (’50). James L. Sherard completed his BSCE degree at Berkeley in 1946 and his master’s in 1948, before heading to Harvard to work with famed soil mechanics Professor Arthur Casagrande (he received his Sc. D. in 1951). Doug Moorhouse completed his BSCE at Berkeley in 1950 and went to work for the California Division of Highways.

 In 1949 Dick and Arnie began discussing the possibility of forming a consulting firm, planning the various steps and how they would finance the start-up, beginning on January 1, 1950. Near the end of these deliberations they invited Ned Clyde to oversee the field operations, because he had become a registered engineer in July 1949 (RCE 7728), which was essential to the legal establishment of their firm. After Dick Woodward passed the CE exam the following spring (becoming RCE 8229 in July 1950), the firm changed its name to **Woodward Clyde Consultants** in 1951. **Arnie** **Olitt** served as the new firm’s Sr VP for client relations. Although Olitt never pursued his engineering registration, he served as President of ASCE’s San Francisco Section in 1968, before moving to New York in early 1969 to oversee Woodward Clyde’s East Coast operations.

 A few years after Jim Sherard completed his doctorate at Harvard he became the fledgling firm’s fourth partner in 1953, managing their first branch office, in Denver. The Denver office served the emerging water resources engineering market, doing work for the Bureau of Reclamation and the Denver Water Board, among others. Many expected that Dick Woodward would return to his native Colorado, but he never did. A California native, **Jim Sherard** (1925-87) moved to the firm’s Oakland headquarters around 1959, and the Oakland office became **Woodward-Clyde-Sherard & Associates**. Sherard retired and lived in Bermuda in the late 1970s, then moved to La Jolla, CA in the 1980s, where he actively consulted on embankment dams until he died in October 1987, at age 62.

 By 1960 the firm had established offices in Oakland, Denver, Omaha, Kansas City, Philadelphia, Montclair, NJ, St. Louis, San Diego, and New York City. **Gerald L. Baker** (BSCE ’56; MS ’58 Berkeley) joined the firm in 1957, and moved to San Diego as that office’s Chief Engineer (he became VP of administration at the firm’s Clifton, NJ office in the 1970s). **Stan Gizienski** (BS ’43 Massachusetts, MSCE ’48 Harvard) opened their San Diego office in 1959 and **Leonard M. Krazynksi** (BSCE ’58 Wash State, MS ’60 Berkeley) was the first manager of their branch office in Orange County, which opened around ~1962. **Ray Lundgren** (1924-2018) (BSCE ’50; MS ’53 Berkeley) joined the firm in 1953 and invested funds to become a partner. He supervised the branch office in San Jose when it opened around 1962 and the Oakland office as SF Bay Regional Manager. In 1971 he was named Executive VP, and later became Chairman of the Board. All of these principals began working for the firm out of their Oakland headquarters. In 1962-63 four of the firm’s senior partners, **James L. Sherard, Richard J. Woodward, Stanley F. Gizienski**, and **William A. Clevenger** (BSCE ’43 Wyoming) co-authored the text ***Earth & Earth-Rock Dams***, published by John Wiley & Sons of New York. This book helped establish the firm’s technical expertise in embankment dams. Dick Woodward, Bill Gardner, and David Greer also collaborated to write the text ***Drilled Pier Foundations***, published by McGraw-Hill in 1972.

 One of the many consultants Woodward Clyde used was Professor **Dimetri P. Krynine**, PE who had taught soil mechanics at Yale and who authored one of the first textbooks in English on soil mechanics, in 1941. Krynine had retired from Yale in 1947 and moved to Alameda (his son was a Professor of Geology at Yale and at Penn State, who had attended Cal Berkeley in the late 1920s). He served as a consultant to Woodward Clyde until he passed away in 1967, and bequeathed his professional library to the firm.

In 1970 Woodward Clyde began splitting their principal offices into separate LLPs, such as **Woodward-Lundgren & Associates**, which was the name used by Oakland office from 1970-78. Woodward Clyde rapidly emerged as ‘super consultants’ doing all sorts of high visibility jobs, for the federal government and the Department of Defense. When they started getting sued for the single family residence work, they veered away from this market, and completed that shift by 1975, leaving that work to their competitors.

**Douglas C. Moorhouse** (1926-2012) (BSCE ’50 Berkeley; MS ’63 Harvard) joined the firm in 1955 after working for the State Division of Highways for five years. He worked in Oakland, then managed the San Diego office before moving east, to attend Harvard while working at the firm’s New York area office in Clifton, NJ. He completed his master’s taking a mix of courses in geotechnical engineering and the Harvard Business School, graduating in 1963. He then co-managed the Clifton, NJ office. In 1973 he succeeded Gene Waggoner as Woodward Clyde’s third President for three years, during the company’s largest period of expansion. **Bill Clevenger** (1919-2009) came from Denver to San Francisco to become Chairman of the Board (retiring in 1984). Moorhouse was named CEO in 1976 and oversaw the establishment of overseas offices till 1987, when he succeeded Dick Woodward as Chairman and CEO, until retiring in 1992. An Oakland native, Moorhouse had a forceful persona that was shaped by his service as an infantryman in the Army’s 66th Division during the Second World War. During a pitched battle near St. Nazaire, France he was seriously wounded, and vowed that if he survived, he would complete college at U.C. Berkeley.

 In 1978 the firm took the name **Woodward Clyde Consultants**, which it kept until it acquisition by **URS-Greiner** in 1997. That same year the firm moved its corporate headquarters to San Francisco, then to Walnut Creek a few years later (around 1984-85), then back to Oakland in the early 1990s. In 1997 WCC was purchased by the **URS–Greiner** combine for $100 million. By that time they had 162 offices with 7000 employees in 17 countries. In October 2014 URS was bought out by AECOM for about $4 billion in cash and shares with another $2 billion in assumed debt.

Some of the original principals in SF Bay Area included: **R. J. Woodward, Jr** (Chairman), **Ned P. Clyde**, PE (President for Field Operations), and **George E. Hervert**, PE (BSCE ’48 Nebraska) joined the firm in 1956 and became Chief Engineer of the Oakland office, and later, Vice President for Administration. **Bernard “Barney” A. Vallerga**, PE became VP and later spun off Materials Research & Development, a Woodward Clyde subsidiary (described below). **John A. Trantina**, CEG (BS Geol ’38 SD Mines, MS ’39 MSM) joined the firm as their chief geologist in 1956, after serving as chief geologist of the Omaha District of the Army Corps of Engineers (he retired from WCC in 1973). Geologist **Lloyd S. Cluff**, CEG (BS Geol ’60 Utah) joined the firm in 1960 and by 1966 was serving as VP and Chief Geologist (in 1985 Cluff became Director of PG&E’s Geosciences Department and their Earthquake Risk Management Program, where he remained until retirement in 2011).

Geologist **Eugene “Gene” B. Waggoner**, CEG (1913-91) (BA Geol ’37, MA ’39 UCLA) joined the firm in 1960, after 10 years with the Bureau of Reclamation and six years running his own consulting firm in Denver. He became Woodward Clyde’s second President and CEO on Jan 1, 1968, after serving as President of the American Consulting Engineers Council the previous year (1966-67). Waggoner was proactive in involving the firm in the formation of the Association of Soil and Foundation Engineers (ASFE) in 1968-69, to help solve the liability insurance crisis that had overtaken the profession in the late 1960s (Woodward Clyde also stopped providing services for single family dwellings). Waggoner stepped down as CEO in 1973, but remained in the Bay Area throughout his retirement. **Woodward** (’77), **Cluff** (’78**), Moorhouse** (‘82), **Vallerga** (’87), **Waggoner** (’87), **I.M. Idriss** (’89), and **Clevenger** (’90) were elected to the National Academy of Engineering.

 Other notables included: **Ed Margason**, GE, CEG (BA Geol ’52, MSCE ’64 Berkeley), who had a balanced background for managing the Oakland office, between 1967-83 (he was first practitioner in California to pass the PE, RG, and CEG written exams), and **Richard G. Campanella** (PhD ’68 Berkeley) who worked in the Oakland office from 1957-65 before joining the faculty at the University of British Columbia, where he became an expert on the CPT method. Other senior geotechnical engineers of the 1960s and 70s included: Senior Project Engineers **Bernard B. Gordon** (BSCE ’36 MIT; formerly of DWR), **John E. O’Rourke**, GE (BSCE CCNY; MSA Vermont), **Jeff Hilliard**, GE (BSCE ’63; MS ‘75 Berkeley) (became VP of John T. Warren & Associates), **Rick Holsinger** (1975-78), and **Randall J. Essex**, GE (BSCE ’75 Rochester; MS’76, MEng ’77 Berkeley), who became Exec VP for Hatch Mott MacDonald in 2001. After Leeds Hill was acquired by WCC in 1982, they used **Thomas A. Lang** (former Chief Engineer of Leeds, Hill & Jewett) as a senior consultant. Another engineer who came from Leeds-Hill was **John A. Bischoff** (BSCE SJSU; MSCE ’74 Berkeley), who initially worked out of Santa Ana, and later managed the San Jose office, after Ray Lundgren became Chirman of the Board. Oakland’slaboratory director was **James H. Wilson**, CSE, who joined in 1962.

The senior engineering geologists in the late 1960s included VP **John Trantina**, CEG, **Lloyd Cluff**, CEG (1933-2019), **Charles L. “Chuck” Taylor**, CEG (from DWR in Sept ’59), **Albert P. Ridley**, CEG, **Fred R. Conwell**, CEG,**Kenneth D. Weaver**, CEG, **Robert G. Russell**, CEG**, Lewis L. Oriard**, CEG, RGP, **Murray Levish**, CEG, **Robert W. Abbott**, CEG, **Richard J. Bielfeld**, and **J. Ross Wagner,** PG(BS Geol ’67; MS ’72; PhD ’78 Berkeley), who moved to MWH in Walnut Creek. **Frank N. Toor**, CEG (BS Geol ’58 Arizona State; MS Mining ’60 Berkeley) directed the office’s geophysical exploration efforts in the 1960s, until he was succeeded by **Louis L. Oriard**, CEG, RGp (BSCE ’47 Gonzaga; MS Geophys ’51 SLU) in 1969. Oriard went onto become the national practice leader in blasting design and impacts.

Partner and VP **Ulrich Luscher** (BSCE ’56 Fed Inst Tech-Zurich; MSCE ’59; ScD ’63 MIT, Asst Prof at MIT 1963-67) joined the firm in 1967 and directed their dams group until 1988, when he was succeeded by **Heinz Berger**, GE(MSCE ’79 Berkeley), and later, by **Noel Wong**, GE (BSCE ’77 Cornell; MS ’78 Berkeley), who came from Leeds-Hill & Jewett in ‘82. Sr VPs in 1990s included **Robert C. Kirby**, GE **Guilaine Roussel**, PE, **H. Richard Soennichsen**, PE, **Heinz Berger**, GE, **Noel Wong**, GE, **Lelio Mejia**, PhD, GE (BSCE Xavier; MS ’78; PhD ’81 Berkeley)[came from Harding Lawson in 1989], **John A. Peterson**, PE, and several others. Their Vice President and Senior Engineering Geologist was **David J. Gross,** CEG (BA Geol ’54 UCLA, retired CA DWR). Other senior associates included **Hans W. Ewoldsen**, PhD, CEG (BSCE ’62, PhD GeoE ’66 Berkeley), **Stephen J. Klein**, GE(MSCE ’79 Berkeley), **Mark Freitas**, GE,(BSCE ’80, MS ’82 Berkeley), etc.

During his tenure with Woodward Clyde VP & Chief Geologist **Lloyd Cluff**, CEG, NAE was successful in engaging many of the biggest and brightest names in the geosciences as technical consultants on seismic hazards, including professors **Bruce A. Bolt**, PhD, RG, RGP and **Harry Seed**, PhD of Cal Berkeley, **Clarence Allen** PhD, CEG, RGP of Caltech, and **D. Burt Slemmons**, PhD, RG of Nevada-Reno. In 1974 Woodward Clyde became the first northern California firm to employ an engineering seismologist when they brought in **Don Tocher**, PhD, CEG, RGPfrom the USGS as Principal and Chief Seismologist. Tocher received his training at Berkeley (AB Phy ’45; MA ’52 and PhD Geophy ’56 Berkeley) working under Perry Byerly as the Berkeley Seismographic Station’s Research Seismologist from 1956-64, then with the USGS from 1964-74. A native of Hollister, Tocher (1926-79) was the first to identify aseismic creep of the San Andreas fault at the Cienega Winery south of Hollister, where Tocher he up the first Earthquake Mechanism Laboratory for the USGS in 1964-67. He died of cancer in July 1979 at age 53.

The early to mid-1970s brought a significant growth spurt to the engineering geology group. Some of these projects included the Alaska Pipeline (beginning in 1970), which involved assessing the Denali Fault and other geologic hazards posed to Alyeska Pipeline Service operations; assessment of the 1973 Managua, Nicaragua earthquake, work for Washington Public Power Supply System (WPPSS, Satsop and others), Battelle Memorial Institute’s Paradox Basin Nuclear Waste Isolation Project (WIP), and the US Bureau of Reclamation, to assess the potential seismic threat to Auburn Dam (then under construction). Lloyd Cluff fielded as many as 150 geologists to evaluate these seismic hazards, and for his role in securing the seismic safety of the the Alakska Pipeline he was admitted into the National Academy of Engineering in 1978.

Some of the geologists Cluff hired included: **Burt** **Slemmons**, PhD, RG, **Kerry Sieh**, RG, NAS (PhD ’77 Stanford), **Dave Schwartz**, PG (PhD Geol ’76 Binghamton), **Marjorie [Whallon] Korringa** (BA Geol ’64 Radcliffe; PhD ’72 Stanford), **Bill Lettis**, PhD, CEG, **Norma Biggar**, CEG (BA Geol ’70 Antioch Col; MS ’74 Alaska),  **Duane R. Packer** (BA Geol ’69 Colorado Col; PhD Geol/Geophy ’72 Alaska), **Woody Savage**,RGP (PhD Geophy ’76 Nevada-Reno), **George Brogan**, CEG (BA ’66; MS ’69 SDSU), **Paul Somerville** (BS Geophy ’69 Univ New England (Australia); PhD ’76 British Columbia), **Walt Silva** (PhD Geophys ’79 Berkeley), **Dave Gross**, CEG (BA Geol ‘54 UCLA), **Bill Hansen**, CEG, **Al Renga**, CEG, **Bill Page**, CEG, **Richard Ely**, RG, **Larry Hutchings** (went onto LLNL), **Ivan G. Wong** (MS Geophy ‘79 Utah), **John Thackston**, CEG, **Jeff McCleary, Karen C. McNally** (PhD Geophy ’76 Berkeley; faculty at UCSC), **Terry Grant**, RG, **Marc Seeley**, CEG, **Gary Carver**, (PhD Geol ’72 Washington), **Tom Rogers**, CEG (MS ’57 Berkeley), **Katherine Hanson**, **Bob Harpster**, CEG (MA Geol ’57 Texas), and **Ben E. Lofgren**, CEG (MS Geol ’47 Utah) retired from the USGS and worked in the Sacramento branch office. **Harpster** (1930-2014) came to WCC from CA DWR and went onto become a VP at the firm’s headquarters in San Francisco in the 1980s. Many of these geologists went onto distinguished careers elsewhere (Korringa was killed in 1974 aboard TWA Flight 841 between Athens and Rome, later attributed to a bomb planted by the PLO). Within Woodward-Clyde, Duane Packer established the first commercial paleomag lab in the world in the late 1970s, where he was assisted by **Phyllis Corbett Steckel**, RG.

Around 1972 Woodward Clyde also established the first hydrogeology group in the Bay Delta Region. At various times, this group included: **Richard Weiss, Carl Fricke,** **Dave Stephenson, John Thackston**, **Dave Kirchner**, **Frank H. ‘Bert’ Swan**, CEG (BS Geol Johns Hopkins), **Jeff Gilman**, and **Dennis McCrumb**. In 1980 **Weiss** started the first hydrogeology firm in the Bay Area (profiled below). A few years later (1983) **Fricke** teamed up with geotechnical engineer **Jim Levine** of WCC to form Levine-Fricke (also profiled below). **Stephenson** established a string of small firms working mainly out of Phoenix and Denver. **Kirchner** also remained in the inter mountain west, establishing his own hydrogeology practice in Phoenix and Denver areas.

 Woodward-Clyde developed an impressively diverse clientele, which included a substantial portfolio of work with the Department of Defense, including Sandia National Lab, and the Air Force. **Robert L. “Bob” McNeill**, PhD, PE (BSCE ’55; MS ’57 Berkeley; DSc ’65 New Mexico) joined the firm as a volunteer soils tech in 1955, and after matriculating thru West Point and UC Berkeley (1950-57) and later, at the University of New Mexico (1963-65), he directed much of this defense-related work, known as the **Special Projects Division** (in the late 60s-early 70s). A large portion of this included the WOWIG, or world-wide geology project intended to asses geologic conditions for atomic demolition munitions (ADM) penetration (after a B-52 lost four nuclear warheads before crashing near Palomares, Spain in Jan 1966).

**Derivative firms of Woodward Clyde**

**Testing Engineers, Inc. (1954-93); TEI (1994-present)**

 **Testing Engineers, Inc (TEI)** of 2811 Adeline St. in Oakland was an independent construction materials testing firm spun off from Woodward-Clyde Consultants in 1954. By 1970 it was being managed by **Merlyn Isaak**, PEand **F. Robert Preece**, PE. The firm was reorganized in 1993-94 as TEI and is now based in San Leandro and operated by **Gary Snyder**.

**Materials Research & Development (1964-82); B.A. Vallerga Inc. (1982-99): Nichols- Vallerga & Associates (1998-present)**

 Firm founded by **Bernard A. “Barney” Vallerga**, PE, NAE (1921-2013) (BSCE ’43, MS ‘48 Berkeley) and **Cecil J. Van Til**, PE, QE(BSCE ’47; MS ’48 Purdue)in 1964 based in Oakland, originally as a wholly-owned subsidiary of Woodward-Clyde. **Fritz S. Rostler** (PhD Chem ’34 Univ Vienna) joined the firm when it opened in 1964 and served as VP for Research, with **Keshavan Nair** (BSCE Indian Inst Tech; PhD ’63 Ohio State) serving as VP and Chief of the Analysis Section.

 Barney Vallerga grew up in Oakland, where he was student body president at Fremont High School (Class of ’39). He attended Cal Berkeley, receiving his BSCE in 1943. He then served as a captain of Army Engineers with Patton’s Third Army in Europe, until 1945. After the war, he found employment with the Hershey Inspection Bureau and began working on his master’s at Berkeley, which he completed in 1948. From 1947-53 he taught pavement design at U.C. Berkeley as a member of the civil engineering faculty. Between 1953-60 he served as Managing Engineer for the Asphalt Institute’s Pacific Coast Division. He pioneered the development of applying oils and resins to reconstitute asphalt pavement. This work led to the widespread use of restorative agents in the asphalt pavement recycling industry, and he was elected to the National Academy of Engineering in 1987. Vallerga was also an Honorary Member of the American Society of Civil Engineers and Association of Asphalt Paving Technologists and a Founding Member of the International Society for Asphalt Pavements. In 1990, Vallerga was elected to the Roll of Honor, the highest Achievement Award conferred by the Asphalt Institute.

**Remmil Corporation (1967-81); Ned Clyde Construction (1981-present)**

 In 1967 **Ned Clyde** (1920-99) took on the additional responsibility to oversee the operations of Remell Corporation, which was created by Woodward-Clyde to repair structures damaged by expansive soils and earth movement, to reduce financial losses engendered by lawsuits against the firm. It was located at 2811 Adeline Street, catty-corner from Woodward-Clyde’s Oakland office.

When these remedial construction activities were completed, Ned Clyde formed an independent firm in 1981, which he christened Ned Clyde Construction (NCC). It was located off MacArthur Blvd in east-central Oakland. They could perform their own engineering schemes, or bid projects designed by other engineers. During the 1980s they often used W.B. Clausen Structural Engineers to do their structural design work.

 Around 1999 the firm moved to more expansive quarters in Concord. Ned’s son-in-law **Myron R. Hagen** (BS Geol ’74 BYU) worked as an engineering geologist for Woodward Clyde from 1974-80 before moving to Ned Clyde Construction. He succeeded as CEO when Clyde died in 1999. **Steve O’Connor**, PE, **William J. Gibson**, PE, and **John S. Pack**, GE all worked for NCC at their Concord location at one time or another. **John Laviolette**, CEG (1947-2014) (BS Geol ’71; MS ’81 CSULB; MSCE 2005 Berkeley) worked for NCC from 1998-2007. In 2012 their principal engineers included Ned Clyde’s grandson **Jon Clyde Hagen**, GE (BSCE 2001 Utah State) (previously with Fugro West), and **Paul Brown**, PE (BSCE Arizona).

**Hallenbeck, McKay & Associates (1970-78); Hallenbeck Associates (1978-2002)**

Founded in 1970 by **John J. Hallenbeck, Jr.**, GE (1930-2006) (BSCE ’56 Berkeley), who worked for Woodward,Clyde, Sherrard in Oakland, and New Zealand native **Alan R. McKay**, SE (1926-2010), who owned his own consulting firm (A.R. McKay & Assoc). They were based in Berkeley, then Oakland, and finally, in Emeryville. Principal Associates included **Edward W. “Tim” Timmons, Geoff Van Lienden**, GE (BSCE ’68; MS ’69 Berkeley), **Curt Jenson**,GE (BSCE ’68; MS ’69 Berkeley), **Joseph Michelucci,** (BSCE ’75; MS ‘76 Berkeley)**, Adel G. Kasim** (MSCE ’73; PhD ’78 Berkeley), **Jim Lott**, GE (BSCE ‘81; MS ’82 Michigan), **Dan Caldwell**, GE (BSCE ’78; MS ’80 Berkeley), and several others. For many years their chief geologist was **Kiyoshi O. “Ki” Tanamachi**, CEG (1926-95). Around 2002 the firm was absorbed by **Allwest Geoscience, Inc.** (founded in 1992 in southern CA as a DVBE firm). **Hallenbeck-Allwest** is now located in Pleasant Hill (profiled below).

**Logistics International Consultants (1977-79);** **GeoResource Consultants (1979-2008)**

 Firm originally founded as **Logistics International Consultants** in 1977 by **Alvin K. Joe, Jr**., CEG (1945-95). He was the son of Alvin K. Joe, Sr., PE (BSCE ’37, MS ’39 Berkeley), who worked for EBMUD. His junior partner and Senior VP was **Alan D. Tryhorn**, CEG (BS Geol ‘69; MS ‘72 Minnesota-Duluth), and the firm’s headquarters was in San Francisco. Prior to this Joe had worked for Hallenbeck-McKay. Vice President and Principal Engineer was **Eric S. Ng**, GE (BSCE ’73, MS ’74 Berkeley). Staff geologists in early 1980s included **Roberta J. Rodrigues-Wright** and **Lisa Derth**, CEG. GeoResources also operated an office in Washington, DC in 1985-87, on contract with the EPA.

 Alvin Joe, Jr. died unexpectedly of a heart attack in August 1995, at age 50 and his wife, **Jeanie Joe**, who was the CFO, took over the reins. Around 2002-03 the firm moved to Oakland, and in 2006 the day-to-day operations were taken over by Alan Tryhorn, CEG. Dr. **Robert M.** “**Bob” Pyke** and engineering geologist **Ken Karaba** worked with them for several years before the firm shut its doors in 2008.

**Merrill & Seeley (1979-85); MS Geotechnical Consultants (1985-92)**

 Founded around 1979 by **Mike Merrill**, PE and **Marc Seeley**, CEG (BA Geol ’69 Berkeley; MS ’85 CSUH) of Woodward-Clyde’s Oakland office and based in Pleasanton. Their senior geologist was **Mike Perkins**, CEG (MA Geol ’74 Berkeley, PhD ’98 Utah). The firm dissolved after pile settlement problems associated with the Benicia Marina project, around 1985. A successor firm, MS Geotechnical Consultants, was operated by Mike Merrill, GE, out of Tracy. Their records were later purchased by Alan Kropp. Marc Seeley moved to Herzog as their environmental services manager from 1989-91 before founding Environmental Geology Services in Santa Rosa (profiled below).

**Richard Weiss Associates (1980-94); Weiss Associates (1994-present)**

 Founded by **Richard B. Weiss**, CEG (BS Geol ’67 NYC; MS EngGeol ’70 Stanford) in 1980, after working for Woodward-Clyde (1972-76) and Harding-Lawson (1977-80). It was the ***first hydrogeology consulting firm in the San Francisco Bay area*** with more than two employees. Originally based in Berkeley, it grew rapidly with the geoenvironmental sector in the mid-1980s, and relocated to Emeryville, where they remain. They also maintain branch offices in Mountain View and Livermore.

 Weiss’s first employee was **Mike Dresen**, CEG, CHG (BS Geol ’76; MS ‘79 CSU-EastBay), who came from Merrill & Seeley in 1982, and who subsequently assumed the role of President and Chief Executive Officer. During their first decade the firm’s largest client was Lawrence Livermore National Laboratory. **Jerry McHugh,** **Joe Iovenitti,** PG, and **Bill McIlvride**, CEG, CHG (BA Geol Boston U; MS ’82 Massachusettes) were managing principals, while **Bob Devany** CEG, CHG (BA Geol ’85 UCSB) currently serves as VP and principal hydrogeologist. **Tom Fojut**, PE, CHG (BA Geol ’90 Berkeley) serves as the firm’s principal engineer and **Donald G. Hill**, PhD, PGP is senior geophysicist. Geohydrologists **Don McEdwards**, CEG, CHG (BA ’72 CSUN; MS ’73; PhD ’79 Berkeley) and Prof. **Jacob Bear** (PhD MinE ’60 Berkeley) of Technion Institute in Haifa were two of the consultants Weiss frequently drew upon in their early years. Bear was a renowned groundwater modeler, and the author of the 1972 textbook ***Dynamics of fluids in porous media.***

 Around 1994 the firm name was simplified to **Weiss Associates** and **Aguatierra Associates** was formed as a dba around the same time, based at the same address. It appears to have been dissolved by 2009.

**Margason Geotechniques (1983-99); EMGeotechniques (2000-present)**

Edward Margason Geotechniques, Inc. was founded in late 1983 by **B.** **Edward Margason,** GE, CEG(BA Geol ’52; MSCE ’63 Berkeley), after he served as Oakland office manager for Woodward Clyde over the previous 25 years. Ed operated Geotechniques from his home in Moraga and specialized in forensic geotechnical engineering with clients such as CalTrans Legal, bay area cities and counties, legal firms, and as a consultant to other geotechnical firms. Around 1999 Ed retired again and moved to Fulton, CA (near Santa Rosa), where he has maintained EMGeotechniques, a modest consultancy, served as president of his homeowners association, and as a consultant on the Rodgers Creek Fault.

**Levine-Fricke (1983-95); Levine-Fricke-Recon (1995-98); LFR-Levine Fricke (1998-2008); ARCADIS (2008-present)**

Began in 1983 as a two-person geoenvironmental firm founded by geotechnical engineer **James D. Levine, PE** (MSCE ’79 Berkeley) and hydrogeologist **Carl Fricke** (BA Geol Augustana College; MA and MS Wisconsin), who had both worked for Woodward Clyde’s Oakland office. The firm has always been based in Emeryville. They combined with Recon Environmental Corporation in October 1995 to become **Levine-Fricke-Recon**. Carl Fricke left the firm in 1995 and Jim Levine served as president till 1998. **Ted Splitter,** GE (MSCE ’74 Berkeley) was chief geotech engineer (became CEO of Northgate Environmental in 2000) and **Chris Nardi,** GE (MSCE ’81 Berkeley) senior geotech engineer in Emeryville, from 1991-2005, before moving onto Klieinfelder in Oakland.

 In November 1998 the name of the company was changed to **LFR Levine Fricke** in California and LFR Inc. elsewhere, because the name “Recon" was reserved in a number of western states. In August 1997 **Levine-Fricke-Recon** and **Zurich Services Corp**. formed an alliance to venture into the risk management market. In Dec 2000 they acquired Reimer Associates, which became LFR-Reimer. The firm eventually grew to have 450 employees with 29 offices, from Maine to Hawaii, with officers Frank Lorincz, Gary Coates, Kevin Warner, Matthew Sutton, Steven B. Blake, and Steven J. Niparko. In January 2008 **LFR Inc.** was acquired by ARCADIS, and this integration was completed on Jan 1, 2010. LFR’s Principal Geotechnical Engineer was **Jeffery R. Raines**, GE. **ARCADIS** bills themselves as a 15,000 person environmental management and consulting engineering firm.

**GeoData, Inc. (1978-90); R.A. Holsinger (1983-2002)**

 GeoData was founded by **Richard A. Holsinger**, GE (BSCE ’73, MS ’74 Berkeley) was a general building contractor based in Berkeley, who specialized in geotechnical construction, slope stability, and foundation repairs. R. A. Holsinger was a consulting company based in Oakland. In 2002 Rick Holsinger affiliated with **Engineered Soil Repairs** in Walnut Creek.

**Johnston-Ridley-McConnell (1984-85); Johnson-McConnell (1985-89); Bay Engineers (1990-2005)**

 Started by **Robert E. “Bob” Johnston**, PE, **Al Ridley** CEG, and **Jack McConnell**, GE of Woodward Clyde’s Oakland office in mid-1984. Originally based in the Kellaway Hardware store on North Main Ave. in Walnut Creek. **Al Ridley** returned to Woodward Clyde, becoming a senior principal in their Las Vegas office, and later, affiliated with Ninyo & Moore. JRM did a lot of work for insurance companies. After Bob Johnston retired in 1989, **Jack McConnell**, GE and **Norm Brudigam**, PE (MSCE ’89 Berkeley) started **Bay Engineers,** based in Lafayette, around 1990. Around 2005 Jack retired and moved to Santa Maria. **David B Hop**, PE was another engineer with the firm. Brudigam became President of Klaus Parking Systems, Inc., a German based firm.

**Geomatrix Consultants (1984-2008); AMEC Geomatrix Consultants (2008-present)**

 Founded by **Mahmut Otus**, GE (BSCE ’56 Robert College; MS ’57 Harvard), **Maurice S. ‘Maury’ Power**, GE(BSCE ’61 Stanford; MS ’62 Berkeley), **Carl Basore**, GE(BSCE ’61 UCLA, MS ’62 Berkeley), **Charles L.** **‘Chuck’ Taylor**, CEG (BS Geol ’58 SDSU), **Mohamed Radwan ‘Rod’ Akky**, GE (MSCE ’70; Ph.D. ’74 UC Davis), and **Khosrow ‘Ross’ Sadigh**, GE (MS ’66 Princeton; MSCE ’68; PhD ’72 UC Davis). All six of the founding partners came from Woodward Clyde’s office in Oakland/San Francisco, and Geomatrix was initially based in San Francisco, with 10-20 employees at the end of their first year. The firm established branch offices elsewhere as they grew. They dominated the geotechnical work for the Port of Oakland, Caltrans, and many other government agencies. They eventually grew to have branch offices, nationwide.

 Other early principals included: **Faiz Makdisi**, GE (BSCE Amer Univ Lebanon; MS ’71, PhD ’76 Berkeley), **Robert ‘Bob’ Youngs**, GE (BSCE ’66, MS ’73, PhD ’82 Berkeley), **Michael L. Traubenik**, GE (MSCE ‘74 Illinois-Chicago), **Kevin Coppersmith**, CEG (BS Geol ’74 Washington & Lee; PhD ’79 UCSC), **Cynthia L. [Shaw] Egan**, GE (managed the firm’s Oakland office), **Frank S. Szerdy**, GE (BSCE ’81 Kings College; MS ’82; PhD ’85 Berkeley), **Susan M. Gallardo**, GE (BSCE ’80; MS ’84 Berkeley), **Pamela H. Rey**, GE (BA Geol ’78 Dartmouth; MSCE ’80 Berkeley), **Kelly McIntosh**, **N. Tim Hall,** CEG (BA Geol ’61 Hamilton College; MA ‘65 Berkeley; PhD ’84 Stanford), **Robert H. Wright**, CEG (BA Geol ’68 SJSU; PhD ’82 UCSC). By 1994 the firm had over 300 employees in seven regional offices across the USA. That year Mahmut Otis and Chuck Taylor both retired and attorney **Edward A. Firestone** (JD ’73 Stanford) served as President of the firm until 1997.

 In June 2008 Geomatrix was purchased by **AMEC Earth & Environmental**. **Makdisi, Youngs**, and **Gallardo** served as Vice Presidents and Principal Engineers. **Egan** retired and **Rey** moved to Exponent in Oakland.

**Leo A. Devito & Associates (1987-93); Geo-Risk Associates (1998-present)**

 Founded by San Francisco native **Leo A. Devito**, CEG (BA Geol ’75 SFSU) around 1987 in San Francisco, then as Geo-Risk around 1998, in San Jose. Leo had previously worked for Woodward-Clyde’s engineering geology group in San Francisco. After closing down Devito & Assoc. in 1993, Leo served as Kleinfelder’s project geologist for the Silver Creek development in southeast San Jose, where he and **Russ Graymer** of the USGS identified the Silver Creek Gravels and the Thompson Creek fault (Graymer, R., and DeVito, L., 1993, *Geology of the southeast Bay Area Hills*, Field Trip Guidebook: Peninsula Geological Society, Palo Alto, California, 18 p.). Former Caltrans District 4 Geologist **David G. Heyes**, CEG worked with Leo for many years. Leo has also worked as a sub consultant for a number of firms, including Rogers/Pacific.

**Treadwell & Associates (1988-91); Treadwell & Rollo (1991-2010); Langan Treadwell Rollo (2010-16); Langan (2016-present)**

 Founded in 1988 by **Donald D. Treadwell**, GE (1941-2016) as **Treadwell & Associates**. Don completed his BSCE in 1964 and MS in 1966 at the University of Arizona before joining Woodward Clyde. From 1969-73 he worked on his PhD at Berkeley under Jim Mitchell on the lunar soil penetrometer for NASA, completing his dissertation in 1976. Don returned to Woodward-Clyde, where he served on the Port Sines Investigation Panel of the Coastal Engineeering Research Council, whose report received ASCE’s ***Arthur M. Wellington Prize*** in 1983. In 1984 he was part of the group that departed WCC to form Geomatrix, where he was an expert in pile foundations and coastal engineering.

 In 1988 he founded Treadwell & Associates, and was joined by San Francisco native **Frank L. Rollo**, GE (BSCE ’63 and MS ’64 Berkeley), who had worked for Harding-Lawson’s SF office since 1964. The firm reorganized itself as **Treadwell & Rollo** in 1991. Rollo also served as President of San Francisco’s Olympic Club in 1992.

In 1993 **Richard D. Rodgers,** GE (BSCE ’71, MS ‘72 Berkeley) joined the firm as their Senior Geotechnical Engineer, coming from Lee & Praszker. He became the Managing Principal & Exec VP of the Bay Area office. The original associates included **Craig Shields**, GE (who left in 2006) and **Philip T. Tringale**, GE (BSCE ’76 Northeastern; MS ‘77 Drexel; MEng ’79; PhD ’82 Berkeley), who joined the firm in 1992 and assumed the presidency in 2003. **Lori A. Simpson**, GE (BSCE ’87 Stanford, MS ’88 Berkeley) was named a Vice President in 2011 (Simpson was elected to the DFI Board of Trustees in 2016). Other senior associates have included: **Dorinda Shipman**, CHG (BS Ohio, MS Wright State), **Hadi J. Yap**, GE (PhD ’81 Berkeley), **Jeffrey Ludlow**, PG (BA Geol Southern Oregon), **John Gouchon**, GE (BSCE ’84; MS ’85 Berkeley), **Maria Flessas**, GE (BSCE Illinois, MS IIT), **Patrick Hubbard**, CEG (BA ‘76 MA ’79 Berkeley), **Phil Smith**, PG (BA Rhode Island, MA Massachusetts), and **Ramin Golesorkhi**, GE (PhD ’85 Berkeley) [from Dames & Moore). In 2009 **Chris Hundemer**, CEG, CHG (BA Geol ’96; MS ’98 UCSC; MSCE 2007 SJSU) assumed the role of senior geologist, until departing in Jan 2012. In 2010 **Hadi J. Yap** became Principal Geotechnical Engineer, and in 2015 **Lou Gilpin**, PhD, CEG (profiled below) was named Chief Engineering Geologist after serving as a consultant to the firm for almost two decades.

 In November 2010 Treadwell & Rollo was acquired by **Langan Engineering & Environmental Services**, a privately held consulting firm founded in 1970 and based in Elmwood Park, NJ, with 500 employees in 14 offices around the world. The acquisition was the first in Langan’s 40-year history, establishing a coast-to-coast footprint for the company by adding 70 high-caliber professionals from Treadwell & Rollo’s offices in San Francisco, Oakland (2000), San Jose (2007), and Sacramento.

**Environmental Geology Services (1989-present)**

 Geoenvironmental and engineering geology firm founded by **Marc Seeley**, CEG (BA Geol ’69 Berkeley; MS ’85 CSUH) and based in Santa Rosa. Marc had previously worked for Woodward Clyde, then as a principal for Merrill and Seeley, and division manager for Herzog Associates and Roy F. Weston.

**Jensen-Van Lienden (1990-2012)**

 Founded in 1990 by **Curtis N. “Curt” Jensen**, GE (BSCE ’68; MS ’69 Berkeley) and **Geoff Van Lienden**, GE (BSCE ’68; MS ’69 Berkeley), who both grew up in Marin County and attended Cal Berkeley for their undergrad and graduate degrees in civil/geotechnical engineering. They previously served as principal engineers at Hallenbeck. Their office was based in south Berkeley, on Alcatraz Avenue. While he was with Hallenbeck and thereafter, Curt Jenson supervised a lot of the geotechnical work that went into the development of Bay Farm Island, dealing with complex consolidation and settlement issues, even employing Menard’s dynamic compaction techniques, etc.

**William Lettis & Associates (1990-2007); Fugro/William Lettis & Associates (2007-11)**

 Founded by **Bill Lettis**, CEG (BS Forestry ’76 Humboldt State; MS Geol ’79; PhD ‘82 Berkeley) in 1990, after he worked for Woodward Clyde and the USGS. The firm specialized in neotectonics work, with its biggest client being PG&E. The firm received numerous USGS-NEHRP grants. By 2007 they supported a staff of 75 with annual income of $15 million. Principals included **Keith Kelson**, CEG(BA Geol ’82 UCSB; MS ’86 New Mexico), **Jeff Unruh**, PG (BA Geol ’80; PhD ’85 UC Davis), **Jeff Bachhuber**, CEG (BS Geol ’84; MS ’87 SJSU), **Chris Hitchcock**, CEG (BS Geol ’90 UCSB; MS ’92 Utah), **John Baldwin**, CEG (BA Geol ’87 UCSC; MS ’96 SJSU), **Mike Gray**, CEG (MS Geol ’84 Arkansas), **Steve Thompson**, PG (BA Geol ’92 Dartmouth; MS ‘97; PhD 2000 Washington), **Bill Godwin**, CEG (BS Geol ’80 Redlands), **Mike Angell**, (BA Geol ’85 UCSC; MS ’87 Imperial College), **Janet Sowers**, PG (BS ’76 Virginia; PhD Geol ’85 Berkeley), **Justin Pearce**, CEG (MS Lehigh), and many others, including **John Wakabayashi** (BA ’80 Berkeley; PhD ’89 UC Davis), who went onto Fresno State as a geology prof in 2005

 In December 2007 Lettis & Associates were purchased by Fugro NV and Bill Lettis joined Fugro’s board (in 2012 he left to begin a new firm, profiled below). Lettis & Associates acquired **Risk Engineering Analysis** (founded by Robin McGuire, PE, SE) of Boulder Colorado in ~2008. L&A had offices in southern California, Denver, Boulder, Augusta, and Hong Kong.

**Engineered Soils Repairs (1992 - present)**

 Founded in 1992 by **Steve O’Connor**, PE (BSCE ’81 Oregon State), **William J. Gibson**, PE (BSCE ’87 SJSU), construction manager **Mark Wilhite**, and **Morgan Anderson** after all had previously worked for Ned Clyde Construction. Firm was originally based in Pleasant Hill, moving to Walnut Creek in 1995. ESR is a design-build construction company, who are capable of doing their own geotechnical engineering. They also provide forensic evaluations of damages and cost of repairs. Senior engineers include **Chris Wilhite**, PE (BSCE ’99; MS 2004 CSU Sacto), **Lisa Hobson**, PE (BSCE ’94 UOP), and **Rick Holsinger**, GE (profiled above).

**Allwest Geoscience, Inc. (1992 - present)**

Founded as a full-service geotechnical and geoenvironmental SBE and DVBE firm in 1992 with offices in Orange, Riverside, Santa Clara and Contra Costa Counties (in Bay Area through acquisition of Hallenbeck Assoc. in 2002). In 2007 the principals included: **Ambrose A. McCready**, PE (BSCE ’72 CSU Sacramento), **Joseph J. Miller**, PE (BSEnvE CPSU San Luis Obispo), **Mark J. Erickson**, PE (BS EnvE CPSU SLO), **Michael D. Geyer**, PE (BS AgEng, BS Soil Sci ’85 CPSU SLO), **Michael L. Leonard**, PE (BSCE ’72, MS ‘74 Illinois), **Robert T. Quarles**, PE (BSCE 2001 Georgia Tech; MS SDSU), and **Adel G. Kasim**, PhD, GE (BSCE ’71 Iran; MSCE ’73, PhD ’78 Berkeley). Their geologist in San Jose is **Rob Wilson**, CEG.

**Michelucci & Associates (1995-2009)**

Founded by **Joe Michelucci**, GE (BSCE ’75, MS ‘76 Berkeley) principal engineer at Hallenbeck in 1995 and based in Burlingame. They added satellite office in Santa Rosa, which was managed by **Dan Caldwell**, GE (BSCE ’78, MS ’80 Berkeley) until July 2009, when the firm closed and he joined Miller Pacific Engineering. Caldwell had previously managed Hallenbeck’s Santa Rosa branch office (1985-95).

**Northgate Environmental Management (2000-present)**

 Northgate Environmental Managament is based in Oakland, which opened in January 2000, with **Ted Splitter**, GE (MSCE ’74 Berkeley), former chief geotechnical enghineer of Levine-Fricke, as a partner and principal of the new firm. In 2002 he was joined by **Dennis Laduzinsky**, CEG (BS Geol ’75 NE Illinois; MA ’85 UCSB), who served as their principal engineering geologist. **Deni Chambers**, CEG, CHG (BA Geol ’85; MS EngSci ’88 Berkeley) now serves as the firm’s president, which is a woman-owned business enterprise. **Maile Smith**, PG (BS Geol SJSU; MS 1998 UBC) serves as principal geologist.

**Terra Engineers (2007 - present)**

 **Guilaine L. Roussel**, PE(BSCE ’75 Ecole Nationale des Ponts et Chaussées-Paris; MS ’78 Berkeley) is President and her husband **Robert C. Kirby**, GE (BSCE ’69 Northeastern; MS ‘72 MIT) the Vice President of **Terra Engineers, Inc.**, an Woman-Owned Small Business (WOSB) geotechnical firm, based in San Francisco. Both previously served a VPs of Woodward Clyde. Senior personnel include **Richard D. Harlan, CEG (BA Geol CSU Chico), Mark R. Caruso, CEG (BA Geol ’89 and MSCE Berkeley), Arlene W. McCoy, PE (BSCE ’83 Vermont: MS Virginia Tech), and Curtis A. Hill. They have been providing innovative solutions to analyze and retrofit earth dams to resist seismic loading, in the South Bay and East Bay areas. In** 2007-09 they partnered with Ninyo & Moore to design the seismic retrofitting of San Pablo Dam.

**Infraterra Consultants (2011 – present)**

 Founded in Sept 2011 by **Ahmed Nisar**, PE (BSCE ’86 Lahore-Pakistan; MS ’88 Berkeley) and **Chris Hitchcock**, CEG, GISP (BS Geol ’90 UCSB; MS ’92 Utah) as a WMBE firm, also certified as a small business enterprise based in San Francisco (LBE micro), specializing in geologic hazard characterization with engineered solutions for lifelines in the water and energy sectors. Hitchcock previously worked for Fugro William Lettis & Associates as a task order manager providing geotechnical support for the California Department of Water Resources in the California Bay Delta area between 2003-11. **Andy Lutz**, CEG also works for the firm.

**Lettis Consultants International (2011-present)**

 In 2011 Bill Lettis and several partners started **Lettis Consultants International, Inc**. (LCI), headquartered in Walnut Creek, CA with additional offices in Valencia, CA and Augusta, GA. Principal figures include: **Bill Lettis, Hans Abramson Ward, John Baldwin, Serkan Bozkurt, Kevin Clahan, Brian Gray, Andy Lutz, Steve Thompson**, **Jeff Unruh, Scott Lindvall, Ross Hartleb, Melanie Walling, Frank Syms, Randy Cumbest, Mike Gray, Gabriel Toro, Robin McGuire, John Vlasity**, **Ivan Wong**, and **Julia Phillips**.

**Dames & Moore Threadline**

**Dames & Moore San Francisco office (1941-99)**

Dames & Moore was formed in Los Angeles in August 1938. Their first branch office was opened in San Diego in early 1941 and San Francisco in the late summer of 1941. This expansion resulted from the firm’s involvement on a series of projects for the U.S. Navy and Army, using its soils and foundation engineering skills to assist in the construction of military facilities. During the war D&M also used its expertise in developing “field soils kits” for the Navy Seabees (construction battalions). One of the offices first employees was **Boris S. Kalinovsky**, PE (1910-92), a Russian emigre educated at Cal Berkeley, who became the firm’s expert on design of pile foundations and bulkhead walls on reclaimed land. By 1945 the senior office engineer in San Francisco was **William W. Brewer**, PE. In November 1947 Brewer and **LeRoy Crandall** in Los Angeles became the firm’s 3rd and 4th partners, with Brewer managing the San Francisco office from 1947-58. **Bill Enkboll** established the Seattle and Portland offices shortly after World War II (1946-47) and **Bill Moore** transferred to San Francisco from Los Angeles in 1953-54 (**Moore** was inducted into the National Academy of Engineering in 1978).

 **SFO** **Principals**: In 1958 Bill Brewer left the firm to start his own consultancy, leaving partners **Bill Moore, William Enkboll**, PEand **Robert T. Lawson**, PE,with Associate **Charles L. Nichols**. In 1958-59 **Lawson** designed the foundations for the first hydrothermal powerplant in the USA at The Geysers area of Sonoma County.When he departedto join Harding Associates in 1960, **Nichols** was offered partnership and **Hank Taylor** (BSCE ’48 Columbia) became chief engineer of the SF office. **Leon Winters**, PE became Chief Engineer in the wake of Brewer’s departure. **Otto Ehrenburg** directed D&M’s soils laboratory in the early 1960s. By 1966 the partners at the San Francisco office included: **Moore**, **Enkeboll**, **Malcolm D. Horton**, PE, **Robert D. Darragh**, PE **Charles L. Nichols**, PE, and **Donald F. Javete**, PE, with geological engineer **George D. Roberts**, PE, CEG were listed as Associates of the firm. **Carl W. Garbe**, PE became a partner around 1968 and coastal engineer **H. Morgan Noble**, PE in 1969. Garbe ran the firm’s Redwood City office in the 1960s and 70s, overseeing the enormous filling of what become Foster City, establishing himself as an industry leader in the handling and placement of dredge spoils.

 By the mid-1960s, some of the senior staff included: **Joe Jeno**, PE, **Roger A. Lowe,** PE, **John W. Desmond**, PE, **Howard Donley,** PE, **Peter Quinn**, PE, and **Willy Norup**, PE, who departed to start Geodex International soil mechnics information service in the late 1960s (based in Sonoma). In 1963 structural engineer **Neville C. Donovan**, SE (BSCE ’54 Auckland U; MS Princeton; PhD ’59 Ohio State) joined the firm as a partner, where he chaired the panel that prepared the ATC-3-06 report and pioneered the use of probabilistic seismic hazard analysis procedures, which he later applied to D&M’s work on the Alaska Pipeline. Some of the 1960s associates included **Karl Gauzer**, **Richard M. Wary**, PE, **James Angemeer**, PE, **Bill Wood**, PE, **Jogeswar P. Singh**, PE, **Robert H. Settgast**, PE, and **William D. (Bill) Kovacs**, PE (MSCE ‘64’ PhD ’68 Berkeley) as the laboratory engineer (went onto become prof at Univ Rhode Island).

In the 1960s the D&M staff included geological engineer **George D. Roberts** (1963-65; and again in 1967-75) and engineering geologists **Francis A. Stejer**, CEG (from Porter, O’Brien, and Armstrong in ‘65), **George N. Borgman**, CEG, **Seymour Goodmacher**, CEG, **Monzell R. Louke,** CEG, **Donald W. Maltzahn,** CEG, **Dick Richards,** and **Will A. Thomas**, CEG. George Roberts had previously served as the Corps of Engineers South Pacific Division Geologist, preceded by assignments in the Little Rock and Seattle Districts, as well as the Ballistic Missile Construction Office in Los Angeles, retiring from the Corps in 1962. He rejoined the Corps Huntsville District in 1965-67, and served as a staff consultant to D&M until 1975. From the late 1970s to mid-1990s Dames & Moore’s senior geologist was **Raymond H. Rice**, CEG (BSCE, BS Geol ’64 Lafayette College; MA Geol ’67 Rice Univ). He was succeeded by **Eric McHuron**, PhD, CEG (PhD Geol ‘76 Rice Univ), who went onto Roger Foott & Assoc.

 In the 1970s some of the key geotechnical principals added were **Julio E. Valera**, PhD, GE (BCE ‘62; MA ’64 Notre Dame; PhD ’68 Berkeley) as a partner. **Ed Rinne**, GE (BSCE ’61 MS ’63 Berkeley) joined the firm in 1968, moving to their London office in 1975 and to Los Angeles in 1978, where he became a partner. **J. P. Singh** (profiled below) and **Sukhmander Singh**, PhD,PE(PhD ’79 Berkeley; later CE Dept Chair at Univ Santa Clara). **Roger Foott**, ScD, GE (profiled below) joined the firm in 1978 and became a managing partner in 1983. **Demetrious C. Koutsoftas**, GE, NAE (BS AgEng ’68 Technion-Haifa; MS ’71 and CE ’72 MIT) joined the firm in 1973 and became a principal. He managed the Hong Kong office before transferring to San Francisco in 1985 (he was elected to the National Academy of Engineering in 2006, while working for Arup). **Willem C. B. ‘Billy’ Villet** (partner), **Eddy Lau**, **John Gibbons**, and **Robert M. “Bob” Pyke** (1973-76). **I. M. Idriss**, PhD, GE (BSE ’58 RPI; MSCE ’59 Caltech; PhD ‘66 Berkeley) worked for the Los Angeles, New York, and San Francisco offices from 1959-69, before joining Woodward-Clyde. Later partners included **Charles V. Logie**, **William Paratore**, and several others. In May 1999 D&M was acquired by **URS** of San Francisco for approximately $300 million, and in October 2014 URS was absorbed by **AECOM**.

**Derivative firms of Dames & Moore**

**Harding Associates** was established in 1957 (see **Harding Lawson threadline**, below)

**Brewer & Associates (1958-68)**

Founded by **William W. Brewer**, PE managing partner of Dames & Moore’s San Francisco office. He moved onto Cooper-Clark as their Vice President in 1968.

**Carlos G. Abrille - Soil Mechanics-Foundation Engineering (1960-2012)**

**Carlos G. Abrille**, PE (1923-2012) was born in Tarlac Province of the Philippines Commonwealth and raised in Manila, where he was educated. In 1950 he moved to the San Francisco Bay area to take a position with Dames & Moore, and became registered as a civil engineer in 1956. He worked for D&M for 10 years before founding his own consultancy in 1960, named Carlos G. Abrille - Soil Mechanics-Foundation Engineering, located on Stearns Avenue in Oakland.

**Robert S. Cooper & Associates (1957-63); Cooper-Clark Consulting Engineers (1963-68); Cooper-Clark & Associates (1968-88)**

Founded in Palo Alto in 1957 by **Robert S. “Bob” Cooper**, PE (BSCE ’52; MS ’53 Berkeley) after having worked for Dames & Moore. **Donald E. Clark**, PE (BSCE ’54 Berkeley) joined Cooper as a partner and Vice President in 1963, or thereabouts. Both men had previously worked for Dames & Moore out of their SFO office. They were joined by former D&M partner **Bill Brewer**, PE (BSCE ’42 Berkeley) in 1968.

Some of the earliest employees included geological engineer **Peter Vardy**, CEG (BSGeoE ’55 Nevada Reno) and engineer **Richard E. Frager**. They started out in SFO, but moved their main office to Palo Alto, with branch offices in San Francisco and Novato by 1972. Sometime later, they moved again, to Redwood City, where they remained until the company was dissolved. VP’s included **Boris S. Kalinovsky**, PE (from Dames & Moore in 1962), **William W. Brewer**, PE, and **Norman Gurin** in the late 1960s, and engineers **Tom Tejima,** **Richard L. Terrell**, and **Martin Owen**. Engineering geologists included **Sterling Atkinson**, PE, CEG, **John T. O’Rourke**,CEG, CHG (MS EngGeol ’80 Stanford, founded **Hydro-Geo Consultants** in 1987), **Gary B. Taggart, John M. Pilling, Michael J. Dwyer**, and **Donald W. Maltzeh**. In the 1970s some of the senior staff included **Jim Baker,** CEG, and **Steve Kramer**,PE(BSCE ’77; MS ’79; PhD ’85 Berkeley; now Prof at Univ Washington), and several others. Although very strong in 1970s, the firm was dissolved around 1988 and succeeded by the **Bay Area Geotechnical Group**, co-founded by **Don Clark** (profiled below).

**Cooper Testing Labs (1987-present)**

In 1987 Bob Cooper’s son **Dave Cooper** founded Cooper Testing Labs in Palo Alto, after working as a soils tech for Cooper-Clark from 1974-87. **Peter Jacke** (MSCE 1994 SJSU) joined the firm in 2002, after having been trained by Julio Valera and Mike Traubenik at Earth Sciences Associates (1984-91 and 1995-96). In 2015 he opened up a second office of Cooper Testing in the Portland area, which became Benchmark Geolabs in April 2017.

**Bay Area Geotechnical Group (1988 – present)**

 The Bay Area Geotechnical Group (BAGG) was founded by **Donald E. Clark** of Cooper-Clark and **Ebbi Hamidieh** in February 1988 in Palo Alto, across the street from Cooper Testing Labs before moving to Sunnyvale. Hamidieh purchased increasing share of the firm from Clark and has served as the firm’s President for more than 20 years. The Chief Engineer/Co-Owner is **Jason Van Zwol**, GE (BSCE ’77; MS ’80 SJSU), who previously worked for PSC (1977-83) and Cooper-Clark (1983-88). **Bruce E. Gaviglio**, GE (BSCE ’67 SJSU), and **Ajay C. Singh**, PE (MSCE ’87 Berkeley; previously worked for Golder Associates) and **Mike Matusich**, GE (BSCE ’90 Santa Clara) are listed as senior engineers. The firm has provided geotechnical input for more than 4,000 projects in the SF Bay Area and are a member firm of ASFE.

**Noble Harbor Engineering (1958-69); Noble Coastal and Harbor Engineering Ltd. (1981-85); Noble Consultants, Inc. (1985-2013); GEC, Inc. (2013-present)**

**H.** **Morgan Noble**, PE (1920-2005) graduated from Stanford in June 1942 with a degree in general engineering. After graduation he attended the naval architecture and ocean engineering graduate program run by MIT for engineering officers at the Naval Academy in Annapolis. He was then assigned to Naval Base San Francisco, where he worked on various harbor engineering projects, with the rank of Lieutenant (O-3). In 1946 he became the first Harbor Engineer for the Orange County Harbor District, and become a registered civil engineer in July 1949.

In 1958 he started **Noble Harbor Engineering**, based in Newport Beach. In 1965 he moved to Belvedere in Marin County, where he remained the rest of his life. From 1969-81 he served as a partner with **Dames & Moore**, out of their San Francisco office. In 1981 he and his son Scott formed **Noble Coastal and Harbor Engineering Limited**.

After Morgan Noble retired in 1985, the firm became **Noble Consultants, Inc.**, with offices in Newport Beach and Tiburon. The firm is run by two of Noble’s sons, **Ronald M. Noble**, PE (MSCE ’69 Berkeley) and **Scott M. Noble** (BA ’73 UCSB; MS Ocean Eng ’76 Oregon State). Ron Noble worked for Dames & Moore’s Los Angeles office from 1977-82, and managed the Newport Beach, and later, Irvine office. Scott Noble managed the office in Tiburon, and later, Novato. In October 2013 the firm was acquired by G.E.C., Inc of Louisiana, a leading provider of engineering, planning, and environmental services.

**D.F. Javete & Associates, Inc. (1985-unkn)**

**Donald F. Javete**, PhD, GE (BSCE ’54, MS ’56; PhD ‘83 Berkeley) was born in San Francisco in 1929 and attended St. Mary’s High School (Class of ’47), where he served as an officer in the JROTC unit. He receving his Bachelors in Engineering (BSE) in 1951 from the University of Santa Clara. He accepted a position with Dames & Moore in San Francisco and continued his education at Cal Berkeley, receiving his BSCE degree in 1954. He then completed his master’s in soil mechanics while working for D&M, with his research emphasis on nuclear methods of determining soil compaction with Professor Robert Horonjeff. He received his MS and passed the PE exam in 1956.

In 1965 he became one of the youngest D&M partners in the SFO office. In the late 1970s he began working on his doctorate with Mike Duncan at Berkeley, and took a six-month leave of absences to complete his dissertation in 1983 (***A Simple Probabilistic Approach to differential settlements of clay***). After retiring from D&M around 1985, he started his own firm, based out of Oakland. One of the projects he worked on involved the ongoing litigation over differential settlement of northern Bay Farm Island, northeast of the Oakland Airport. Some of the unique aspects of this effort are summarized in J. M. Duncan, D.F. Javete, and T.D. Stark’s 1991 article titled “***The Importance of a Desiccated Crust on Clay Fill Settlements***,” in Soils and Foundations v. 31:3, p. 77-90.

**Berlogar, Long & Associates (1973-83); Berlogar Geotechnical Consultants (1984-2011); Berlogar Stevens & Associates (2011-present)**

Berlogar, Long & Associates was founded in 1973 by **Frank Berlogar**, III, GE, **Leonard O. Long**, PE, and **Henry L. Minch**, CEGin 1973 in Palo Alto/Menlo Park. The firm later moved to Fremont, and then to Pleasanton, where they have remained since 1983. **Frank Berlogar** received his BSCE from Berkeley in 1967, and worked on the Redwood Shores project for Dames & Moore (1967-69), for W. A. Wahler & Associates (1969-71), and managed Geolabs Bay Area office from 1971-73, before founding BLA in 1973. **Leonard O. Long** (1917-2010) was born in Alameda and received his bachelor’s degree in forestry at Berkeley in 1940, living in the same fraternity as Ben C. Gerwick. Both served as naval officers in the Pacific during World War II. After the war Long returned to Berkeley to take courses in civil engineering, and took a position with *Abbot A. Hanks, Inc., Engineers, Assayers, Metallurgists, Chemists, Soils and Foundations, and Construction Testing*, based at 1142 Howard Street in San Francisco. Len came to supervise the firm’s soils and foundations work and became a PE in 1962. He then served as Vice President of Geo-Engineering with Oliver Gilbert, next door to Abbot A. Hanks on Howard Street (1964-68). Around 1968-72 Len managed the Bay Area office of Lowry and Associates in Alameda, and started his own firm in San Francisco, shortly before going into the partnership with Berlogar in 1973.

Berlogar-Long’s first Chief Geologist was **Henry L. Minch,** CEG (1928-2008), who received his bachelor’s degree in geology from the University of Washington in 1952. He had previously worked on embankment dams in Washington and British Columbia. He was a junior partner, remaining with the firm till 1987, when he retired. Some of the early employees included **W.** **Darwin Myers**, CEG, **Charles F. Crittenden**, **George O. Reid,** CEG, **Michael N. Clark**, CEG, **Richard T. Gomm**, GE, and **Lawrence Pavlak**, CEG.

In 1981 Leonard Long retired and in 1984 the firm moved to Pleasanton, where it became **Berlogar Geotechnical Consultants** (BGC). This placed them closer to the new housing tracts being constructed in the East Bay Hills and Amador Valley. In the 1980s-90s some of their senior staff included: **Mark Milani, Frank Groffie**, CEG (BA Geol ’82 Berkeley), **Kenneth A. Bedde** (BSCE ’76 Berkeley), **Paul Lai**, GE, and **Philip C. Tse**, GE were senior geotech engineers. **Ray Skinner**, CEG was their chief geologist for many years (before moving to ENGEO). **Ted** **Bayham**, GE, CEG served as a senior engineer in the 1990s (before moving to ENGEO). **Bill Stevens**, GE and **Steve Tsang**, GE were the senior geotechnical engineers until 2013. In 1992 **Peng K. Leong**, PE (BSCE ’81 Toronto; MS ’82 Berkeley) left Levine-Fricke (1988-92), eventually becoming one of the firm’s principal engineers. **Kevin Ryan**, CEG (BS Geol 1998 CSU Humboldt) was the firm’s engineering geologist from 1999-2009.

In 2011 **William R. “Bill” Stevens**, GE (BSCE Virginia; MSGeoE ‘85 Arizona) became a partner, and the firm’s name changed to **Berlogar Stevens & Associates**. Prior to this Stevens had served as one of Berlogar’s principal geotechnical engineers, and prior to that, he worked for Consolidated Engineering Labs in Pleasanton. He also served as a Director on the Alameda County Zone VII Water Board for 16 years. In 2017 Stevens departed to start up Baez Geotechnical Group (profiled below). In 2014 **Greg Ruf**, GE (BSCE ’79 SJSU) came from URS to succeed him as the firm’s principal geotechnical engineer.

**Darwin Myers Associates (1979-present)**

 Founded by **W. Darwin Myers**, PhD, CEG (BA Geol ’63 Case Western; PhD ’69 Wisconsin), based in Concord, and later in Martinez. Myers worked for Berlogar-Long Associates before serving as Contra Costa County’s first County Geologist from 1975-79. He was succeeded by Jim Baker (1979-81) and Todd Nelson (1982-90), before resuming the role of reviewing County Geologist on contract with the Planning & Community Development Department, beginning in the mid-1990s. As of 2019 he was still under contract to perform reviews for Contra Costa County Planning & Community Development, as well as three different GHADs in Contra Costa County.

**Alpha Consultants (1984-90); DuPont Environmental**

Alpha Consultants was founded by **Lenard D. Long**, PE (BSCE ’76 CSU Chico) and **George O. Reid**, CEG (BS Geol ‘72, MS ’75 SJSU) in 1984 and based in Pleasanton. They met while working for Berlogar and formed a team that worked mostly on geoenvironmental work, selling their holdings to **DuPont Environmental** around 1990.

**George Reid** then founded **Amador Engineering & Infrastructure** in 1997, also based in Pleasanton. A year and a half later, he started up **GRA Associates** (in 1998), which engaged in environmental and expert witness work, also based in Pleasanton. In 2005 he then started **Pacific Terra Resources** in Pleasanton.

**Lenard D. Long**, GE went onto found **ACI Construction Engineering** in May 1988, based in Pleasanton, specializing in geoenvironmental remediation work. In April 1991 he formed **Sunriver Engineering & Construction**, based in Brentwood. In 1998 he affiliated with ERM-West, ageoenvironmental firm that opened a branch office in Walnut Creek in the mid-1990s. In 2007 Long opened a Brentwood office for SCS Engineers, environmental consultants and contractors (est. 1970), who have 47 offices in 23 states, doing environmental remediation work. In 2011 Long was listed as a Vice President of Stearns, Conrad and Schmidt, Consulting Engineers, Inc. (SCS).

**Howard F. Donley & Associates (1975-78); Howard-Donley Associates (1978-1984)**

**Howard F. Donley**, PE **(**1937- )(BSCE ’60 Wyoming; MS ’61 Montana) had worked for Dames & Moore from 1963-72, when he opened a Bay Area office for Fugro (profiled below), which only lasted a few years. In 1975 he established Howard F. Donley & Associates in Redwood City. Among their earliest consultations was the Seismic Safety Element for the City of Burlingame in 1975.

In 1978 Donley joined with **Terry R. Howard**, CEG (1939-2005) to form Howard-Donley Associates. Terry Howard (PhD GeoE ’73 Berkeley) had received his graduate training in geological engineering at Cal Berkeley and was a Professor of Geological Engineering at the University of Idaho. Their new firm was also based in Redwood City. Some of their employees included **Vince Pascucci**, GE, **Michael N. Clark**, CEG, **Mike Coco**, **Joel Baldwin**, CEG (who came from Woodward Clyde in Santa Ana in 1979), and **Roberta J. Rodrigues**.

**Baldwin-Wright, Inc. (1986 - 95)**

Founded in March 1986 by **Joel E. Baldwin**, CEG (BS Geol ’75 CSULB; MS Geol ’81 CSULA) of Howard-Donley Associates and his wife **Roberta J. (Rodrigues) Wright** (BA Geol ’75 SFSU),who had worked for GeoResource Consultants and Howard-Donley. They were registered as a WBE geotechnical firm and based in Pacifica, where they operated for about 10 years. Joel departed in 1990 to form his own firm (profiled below) while Roberta kept the firm running until approximately 1995.

**Earth Investigations, Inc (1990-2004): Earth Investigations Consultants (2004-present)**

Around 1990, **Joel Baldwin**, CEG formed Earth Investigations as a separate engineering geology firm, based in Brisbane, later moving to Pacifica. In 2004 they reformulated as Earth Investigations Consultants, Inc., with their Chief Engineer being **Thomas ‘Tom’ Stimac**, GE (BSCE ’68 Berkeley), formerly of Harding Lawson. Stimac now owns his own consultancy, Stimac Associates.

**Harlan Engineers (1972-80); R.C. Harlan & Associates (1980-84)**

 **Richard C.** ‘**Dick’ Harlan** (1929-2008) received his BSCE from Stanford in 1952, attending on an NROTC scholarship. After serving two years in the Navy, he joined Dames & Moore in 1954, working at their offices in Los Angeles and New York. While working in New York he attended evening graduate courses in soil mechanics at Columbia from Professor Don Burmister. In 1958 he joined Bechtel Civil Services in San Francisco to work on Mammoth Pool Dam for Southern Cal Edison in the Sierras, and later, on the Churchill Falls Project in Quebec. He then returned to Bechtel’s home office in San Francisco, where he worked on the designs and construction of the Powell and Civic Center BART stations on upper Market Street, in the late 1960s.

 In 1972 Harlan left Bechtel to form **Harlan Engineers** as an Earth Systems company, with offices in San Francisco and Concord. They perfiormed construction observation and testing work on subdivisions being graded in Contra Costa County and elsewhere. Harlan used **Richard M. Lee** as his senior soils tech. In the early 1970s Harlan also taught soil mechanics at San Jose State. Harlan left the Earth Systems family in 1975 and started **R.C. Harlan & Associates,** based out of San Francisco, while **Harlan Engineers** continued to be operated for about a year by Al Gribaldo and several of the Earth Systems partners. Harlan used **Robert H. York**, GE (1940-2005) as his senior geotechnical engineer and **Chuck Trantham**, CEG (BA Geol ’58 Colo State; MS work Oregon) came over from Bechtel in 1973 to serve as the firm’s engineering geologist on contract. R.C. Harlan pursued water resources work with various agencies in northern California.

**Harlan-Miller-Tait (1984-89); Harlan-Tate Associates (1989-2006)**

 Harlan-Miller-Tait was established in San Francisco in 1984 by **Dick Harlan,** (BSCE ’52 Stanford; MS work Columbia), **Gene Miller** (BSCE ’51 Colorado A&M; MS ’56 Georgia Tech), **Richard G. Tait** (BSCE ’61; MS ‘62 Berkeley), and **Robert H.** “**Bob” Wright**, CEG (BA Geol ’68 SJSU; PhD ’82 UCSC) as the general partners. Gene Miller and Dick Tait had previously worked for Harding-Miller-Lawson and Wright for Earth Science Associates. In 1989 Gene Miller departed to start Miller-Pacific Engineering, and Dick Harlan retired around 1997. Some notable employees included geotechnical engineers **Bob York, David T. Schrier,** andgeologists **David R. Montgomery** (BS Geol ’84 Stanford; PhD ‘91 Berkeley) and **G. Reid Fisher,** CEG(BA Geol ’80 Carlton; PhD ’87 UNR) from 1990-99,and several others. They appear to have opened branch office or moved to Mountain View in early 2000s, and ceased operating in 2006.

**Telegraph Avenue Geotechnical Consultants (TAGA); TAGA software; Robert M. Pyke Consulting Geotechnical Engineer (1977-2008)**

 Founded by Australian native **Robert M. “Bob” Pyke**, GE (BSCE ’63 Univ Sydney; PhD ’73 Berkeley) in January 1977, after working for Dames & Moore (1973-76). From 1963-69 he worked for the Commonwealth Department of Public Works in Canberra, Australia, before beginning graduate work at Berkeley. TAGA was a small firm on Telegraph Avenue in Berkeley. They re-formated FORTRAN slope stability programs emanating from Berkeley’s geotechnical program for use on personal computers of that era, and offered consulting services to most of the geotechnical firms in California during the 1980s.

 For several years Pyke was assisted by **Mohsen Beikae** (MSCE ’77; PhD ‘81 Berkeley) and several other graduates from the Berkeley’s geotechnical program (Beikae went onto to develop QUAD4M with I.M. Idriss and Martin B. Hudson at UC Davis in 1993-94 and 2003-04, while working for MWD in Los Angeles). **Ian R. Brown** (MS ’79, DEng ’81 Berkeley) and **Peter Wood**, geological engineering consultants based in Wellington, New Zealand assumed responsibility for further development of the ***TAGAsoft*** program library.

Pyke continued to specialize in consultations relating to dynamic slope stability, which was a niche that expanded in the 1980s and 90s. Pyke also performed research for EPRI and did contract work as a forensic specialist for several decades. In 2008 he joined ARCADIS US Consultants in Walnut Creek as a VP, but he departed after two years. He has since been promoting alternative schemes for the proposed peripheral tunnel aqueduct around the Sacramento-San Joaquin Delta and has re-opened TAGA, operating out of Lafayette.

**Trans Pacific Geotechnical Consultants (1983-present)**

Started by **Herb Chan** and **Eddy Lau,** GE (MSCE ’65 Berkeley) in Redwood City and San Francisco in May 1983. Their senior engineer was **William C. Wood**, GE (BSCE ’61 Berkeley), who also came over from Dames & Moore, a few years later.

**Tejima –Atkinson (1984-93); Tejima & Associates (1993-97)**

 Founded by **Tom Tejima**,GE(MSCE ’74 Berkeley)from Dames & Moore to Cooper-Clark, then joined with **Sterling K. Atkinson**, **Jr.**, PE, CEG(1928-96),who had previously worked forDames & Moore, USGS in Menlo Park, Leighton, and Cooper-Clark.

**Clark GeoTechnical, Inc. (1981-present); Applied Geosystems (1985-91)**

 Founded by **Michael N. Clark**, CEG, CHG (BA Geol ’77; MS ’78 UCSB) in January 1981 after having worked for Howard-Donley and Berlogar-Long. The firm was based in Fremont and assisted other geotechnical firms. In 1985 he founded Applied Geosystems. He became a registered hydrogeologist in 1995.

**Roger Foott Associates (1986-94)**

 Founded in 1986 by **Roger Foott**, GE (BSCE ’67 Univ Birmingham; D.Sc. ’73 MIT), managing partner at Dames & Moore (1983-86), noted for developing SHANSEP (Stress History and Normalized Soil Engineering Parameters) approach for dealing with soft clays in the Atchafalaya Basin, while working with Prof. Chuck Ladd at MIT in the early 1970s. The article summarizing this work by Ladd and Foott in 1974 was recognized by ASCE’s ***1976 Norman Medal***. As principal at D&M, Foott supervised design work on settlement of enormous fills for Hong Kong Int’l Airport and Kansai Int’l Airport near Osaka. For this pioneering work he shared ASCE’s 1988 ***Middlebrooks Award*** with fellow D&M principals **Demetrious Koutsoftas**, and **Leo Handfelt**. Some of Foott’s senior staff included **Frederick M. Brovold**, GE, **Frank S. Szerdy**, GE (who went onto Geomatrix), **Roy A. Bell**, GE (from Dames & Moore), **Elizabeth Bialek** (BSCE ’89; MS ’91 Berkeley), and engineering geologist **Eric J. McHuron**, CEG (BA Paleo Berkeley; PhD Geol ‘76 Rice Univ), most of whom came from Dames & Moore. After Foott died of cancer in 1994 the firm was absorbed by **GEI Consultants** of Woburn, MA (see GEI Consultants profile below).

**Ed Rinne** (BSCE ’61, MS ’63 Berkeley) left D&M to become manager partner of Kleinfelder’s corporate headquarters in Walnut Creek in 1984-86, then as geotechnical discipline leader until 2006 (see Klienfelder threadline).

**Julio E. Valera** GE, (BSCE ‘62, MS ’64 Notre Dame; PhD ’68 Berkeley) was a native of the Dominican Republic, who immigrated to Astoria, NY. He attended LaSalle Academy (’58) in Providence, RI before atteneding Notre Dame from 1958-64. After completing his PhD at Berkeley in 1968 he worked for Dames & Moore in SFO, where he supervised the firm’s work in dynamic stability analyses of dams and harbor facilities. Around 1977 he joined Earth Sciences Associates in Palo Alto. In 1990 he founded Valera GeoConsultants in Mountain View, but then rejoined Earth Sciences Associates. Around 1998 he joined Knight Piesold Consultants in their Denver office. In late 2002 he started Valera Geoconsultants, based in Lakewood, Colorado, and retired in 2008.

**Willem C. B. “Billy” Villet** (BSCE Univ Pretoria; MCSE ’77, PhD ’81 Berkeley) was a native of South Africa, who came to Berkeley as a graduate student in the fall of 1976. He joined Dames and Moore in 1981 and rose quickly through the ranks to become a managing partner, even turning down an offer to replace Professor Mike Duncan at Berkeley when he departed for Virginia Tech in 1984. Villet joined **Geosyntec Consultants** in Walnut Creek ~2001. He is now President and CEO of **MMI Engineering**, based in Oakland, after they were purchased by **Geosyntec Consultants** in 2009. MMI also have offices in WA, TX, and the UK, and consult on projects all over the world (see Geosyntec write-up).

**Storesund Consulting (2005-present)**

 **Rune Storesund**, DEng, GE (BSCE 2000; MS ’02; DEng ‘09 Berkeley) founded his own consultancy in 2005, based in Albany. Previous this he had worked for Berlogar Geotechnical (2000-01), Subsurface Consultants (2001-02), and Fugro West (2003-05). After completing his doctorate at Berkeley in 2009, he worked for Noble Consultants, but re-opened his consultancy in Kensington the following year. Most of his work has dealt with levees, landslides, shoreline retreat and erosion, channel and wetlands restoration, and forensic support. Since 2005 he has worked on research projects funded by the National Science Foundation, in Louisiana, the 2008 and 2011 floods of the Mississippi River, the Mississippi Delta, and on the California Bay Delta region, including the 2004 Upper Jones Tract levee failure. Dr. Storesund also currently serves as the Executive Director of the *Center for Catstrophic Risk Management* at U. C. Berkeley.

**Demetrious Koutsoftas Geotechnical Consultants (DKGC, Inc) (2010-present)**

**Demetrious C. Koutsoftas**, GE, NAE (BS AgEng ’68 Technion-Haifa; MS ’71 and CE ’72 MIT) departed D & M to joinURS Consultants, thenARUP as a senior associate, when he was elected to the ***National Academy of Engineering*** in 2006. He later retired and started his own consultancy, Demetrious Koutsoftas Geotechnical Consultants (**DKGC, Inc**).

**Lai & Associates Geotechnical Engineers (2009-present)**

 Founded by **Pamela Y.C. Li**, GE and **Paul Sai-wing Lai**, GE (BSCE ’83 Taiwan Univ; MS ’86 Berkeley) in July 2009 as a WBE firm, based in Pleasanton. Li had previously worked for Morrison Knudsen Corp. in San Francisco, while Lai had served as a principal geotechnical engineer at Berlogar Geotechnical Consultants, since 1994. In 2013 they were joined by **Steve Tsang**, GE (BSCE ’82 Illinois; MS ’83; MEng ’84 Berkley) as Vice President and Principal Engineer. Previous to this he had worked for GeoResources, Fugro, and Berlogar.

**Ryan Geological Consulting, Inc (2009-present)**

 Firm founded by **Kevin J. Ryan**, CEG (BS Geol 1998 CSUHumboldt) and based in Orinda, after working for Berlogar Geotechnical from 1999-2009. He works with numerous consulting geotechnical engineers in the greater SF Bay - Delta Area on a wide range of projects.

**Baez Geotechnical Group (2017-present)**

 Baez Geotechnical Group, Inc (BGC) was formed in Oct 2017 by **William R. “Bill” Stevens**, GE (BSCE Virginia; MSGeoE ’85 Arizona) and as a subsidiary of **Baez Design Group**, general engineering contractors, founded in 1998 by **Rusty B. Baez** of Turlock. One of their project engineers is **Stefanie Parman**. They maintain offices in Livermore and Turlock.

**Harding-Lawson Threadline** (in Dames & Moore thread)

**Merwin-Harding, Inc. (1955-69); Richard S. Harding & Associates (1957-66); Harding-Miller-Lawson & Associates (1966-77); Harding-Lawson Associates (1977-2000)**

In 1955 construction engineer **Oliver E. Merwin**, Sr. (1898-1974) and **Richard S. Harding** (BSCE ’50 Texas) (1923-2015) formed **Merwin-Harding**, a general engineering construction and drilling firm based in San Francisco. Merwin had supervised heavy construction jobs for several decades before joining Dames & Moore during the Second World War in 1943. He continued his role as a resident partner in the San Francisco office of D&M until 1959, when he joined the newly formed Richard S. Harding & Associates as a “supervising principal.” Dick Harding had served as an Army combat engineer in the European Theater during the Second World War and Korean War, before joining Dames & Moore as a staff engineer in 1951. Merwin-Harding performed the exploratory drilling for various clients, then for Harding & Associates after 1957, and then for Harding-Miller-Lawson through the late 1960s.

The geotechnical consulting firm **Richard S. Harding & Associates** was founded in 1957 by **Dick Harding**, PE. In 1958 **Eugene A. Miller**, PE (BSCE ’51 ColoState; MS ’56 Georgia Tech) came from Dames & Moore as a junior partner. In 1960 Merwin and Harding were joined by **Robert T. Lawson**, PE (BSCE ’48 Washington). Bob Lawson had been one of the youngest partners at Dames & Moore’s San Francisco office (1956-60). He had previously worked at D&M’s Seattle (1948-50) and Los Angeles offices (1952-56), interrupted by service in the Marine Corps during the Korean War (1950-52). In 1962 **Henry T. “Hank” Taylor**, PE (BSCE ’48 Columbia) left Dames & Moore to become the principal operating the firm’s new branch office in San Francisco.

In 1966 Harding Associates became **Harding-Miller-Lawson** **and Associates**. Their home office was in San Rafael with branches in San Francisco, Santa Rosa, and Martinez. In the 1970s, they were serving Marin, San Francisco, north San Mateo, Contra Costa, and Sonoma Counties. The fiveoriginal principals were: **Richard S. Harding**, PE, **Eugene A. Miller**, PE; **Oliver Merwin**, **Robert T. Lawson**, PE, and **Hank Taylor**, PE. The original associates included: **Keith H. Bergman**, GE(BSCE ’53 Michigan Tech; MS ’59 Berkeley), who joined the firm in 1961; **Lyle E. Lewis**, GE (BS AgEng ’62 CSPU Pomona; MSCE ’71 Berkeley) who joined the firm in 1962 and became their first lab director; **Gerald M. Diaz**, PE (BSCE ’59 New Mexico State) came from the Division of Highways in 1963 to manage the firm’s Santa Rosa branch office, **Thomas J. Lowry**, GE (BSCE ’50 Berkeley) left Raymond International in 1964, **Jay M. England**, PE (BSCE ’59 Penn State), **Al Buchignani**, PE (BSCE ’57, MS ‘68 Berkeley), and **Frank L. Rollo**, PE (BSCE ’63, MS ‘64 Berkeley).

In the early 70s their senior staff expanded to include: **Richard G. Tait**, PE (BSCE ’61; MS ‘62 Berkeley), **Tom Stimac**, PE (BSCE ’68 Berkeley), **Roy A. Bell**, PE (BSCE Nevada-Reno), **Dennis Furbe**, PE, **Hugo J. Hanson**, GE (BSCE ’51, MS ‘69 Berkeley), **Arthur Stephens**, PE (BSCE ’63 Iowa State), **Cecil B. Wood,** GE (BSCE Heald College) ran the branch office in Martinez, and then Concord, for several decades, **Jay A. Nelson**, GE, **Donald G. Gray**, GE (BSCE ’69 Utah; MS ’70 Berkeley), **Don Quigley**, PhD, GE (BSCE ’67, MS ‘78, PhD ’81 Berkeley), **Don Schreuder**, GE, **Don Bruggers**, GE (BSCE ’76 Michigan State) went onto manage Anchorage office (joined ENGEO in 1996), **Kai Wong**, PhD, PE (went onto AAT in Singapore), **Lelio Mejia**, PhD, GE (went to Woodward-Clyde in 1989).

**Gerry Diaz** PE became the firm’s Chief Engineer in 1971, and departed to manage the Orange County office in 1979. **J. P. Singh**, PhD, GE supervised their geophysical services wing (after Ken Blom departed in 1983) and their geotechnical earthquake engineering expertise between 1980-87 (he departed to start Geospectra, profiled below). During the late 70s-early 80s **Ed Hultgren** and **Tom Cundey** (MSCE ’77 Berkeley) ran the firm’s Honolulu office. In the late 1990s the firm’s Regional Manager was **Claude Corvino**, GE (BS Geol ’75; MSCE, ‘77 UCLA), and Principals **David Leland** and **James G. McClure**, PhD, GE (BSCE ’73, MS ’74, PhD ’80 Berkeley). Other geotech engineers in the 1980s included **Tom A. Tobin** (BSCE ’78; MS ’79 Berkeley), and many others.

 Harding’s first engineering geologist was **Richard “Dick” Warton**, followed soon thereafter by **Erwin C. “Chuck” Winterhalder**, CEG (BS MinTech ‘51 Berkeley), who joined the firm in 1962 and served as the Chief Geologist for three decades. Other senior geologists included **Frank Kresse** CEG (BA Geol ’56 Berkeley; joining in 1976), **Mike Huffman** CEG (BA Geol ’62 Berkeley), **Steve Korbay**, CEG (BA Geol ’57 Berkeley), **Gary Van Houten**, CEG, and **Jim Joyce**, CEG. From 1973-83 their chief geophysicist was **Kenneth Blom,** PG, RGP (who founded Norcal Geophysics in 1983). From 1969-90 their senior soils technician was **David M. Lallatin**. In 1990 he stood up Lallatin Geotech to provide site inspection and testing services, out of Petaluma. From 1984 forward, waste management engineering fueled HLA's growth, precipitating a steady rise in its sales.

**Harding Lawson Associates Group, Inc. (1994-2000)**

 In 1994 Harding Lawson Associates went public with its privately held stock, bringing considerable windfall profits to the principals and senior associates who owned private shares. The new publicly-owned corporation was called **Harding Lawson Associates Group Inc.**

**Harding ESE/MACTEC (2000-present)**

 In June 2000 **Harding Lawson Associates Group was purchased by MACTEC and** merged withanother MACTEC subsidiary firm **Environmental Science & Engineering Inc.** to form **Harding ESE,** a wholly owned subsidiary of MACTEC.This allowedMACTEC to expand into the oil & gas, mining, manufacturing, consumer products, chemical and pharmaceutical, aerospace, transportation, telecommunications and waste management industries. **Claude Corvino**, GE(BS Geol '75; MSCE, '77 UCLA) served as Harding ESE’s president from 2000-02, when the firm had 1,750 employees and $225 million in revenue.

**Derivative firms of Harding-Lawson**

**Diablo Soil Engineers (1974-2010); Diablo Engineers, Inc (2000-05)**

 Founded by **Herbert R. Volin**, GE (BSCE ’67 Heald College; MSCE ‘74 SJSU), after he had worked for Harding-Miller-Lawson, Caltrans, and United Soil Engineering. Office originally located in Orinda, then in Lafayette, and finally, in Walnut Creek. His first geologist was **Dean Affeldt**, CEG (who moved onto Purcell-Rhoades), followed by **Mike Carey**, CEG (who started Adobe Geotechnical in 1993). Other staff engineers have included **Dave Mathy**, GE (MSCE ’79 Berkeley), **Chris Nardi**, GE (MSCE ’81 Berkeley), **Gary Underdahl**, GE (BSGeoE ’67 Minnesota), **Mark Wahler**, GE (MSCE ’77 Berkeley), **John Stout** (BSCE CSU; MS SJSU), formerly with MK and IECO.

 In 2001 **Herb Volin**, GE (Diablo Soil Engineers), **John R. Sutton**, GE (The Sutton Group) and **Edward Searby**, GE (North Coast Engineering) formed **Diablo Engineers, Inc.** Following Ed Searby’s death in 2005, that company was dissolved.

**Consulting Quality Control Engineers (1976-80); Alexander Buller Associates (1980-95); Buller Group (1995-2000)**

 Series of small firms founded by **Alex Buller**, GE (RCE 19648/QE 1333/GE 172) in Martinez, and later, Oakley, in eastern Contra Costa County. Buller had previously worked for Harding Lawson in San Rafael and PSC Associates in Mountain View. Some of his staff engineers included **Don Stockwell** (in the 1980s)and **Mark Schroeder** (in the 1990s). Alex began as a quality control engineer, performing soil compaction and concrete tests, with occasional foundation engineering projects, mostly on distressed properties. Buller died in June 2000, at age 65.

**Donald Herzog & Associates (1973-89); Huntingdon Engineering and Environmental (1989-96)**

Donald Herzog & Associates was founded by **H.** **Donald Herzog**, GE (BSCE ’64 GeorgiaTech; MBA ’72 USF) in April 1973. Don came to the Bay Area in 1964 to work for Caltrans, Harding Lawson, and Peter Kiewit Sons on the BART Transbay Tube, then for Dillingham for the Embarcadero One project. In 1970 he rejoined Harding Lawson at their Novato office, and also worked out of their branch office in Guam. Don started his own firm in 1973, based in Mill Valley (Marin County). He was an original member of the Geotechnical Technical Advisory Committee (TAC) to BORPELS in the late 1980s, when GE registration was established. Herzog & Associates was the largest geotechnical firm based in Marin and Sonoma Counties during the 1970s and 80s.

**John Hom** was the firm’s first engineer employee and **Michael D. Malone**, CEG was the senior geologist, through the late 70s to mid-80s. In 1983, **Fred Maurer**, GE (BSCE ’73; MS ’78 UC Davis) came from Kaldveer Associates to manage the firm’s geoenvironmental operations, remining until 1993. In the early 1990s some of their senior geotechnical engineers included **Lyle E. Lewis**, GE (BS AgEng ’62 Cal Poly; MSCE ’71 Berkeley) and **Nersi Hemati,** GE (MSCE ’78 Berkeley), both from Harding Lawson. After Malone left, they used **Donn Ristau**, CEG (BS Geol ’70 CSUN; MS ’73, PhD ’77 UC Davis) as their senior engineering geologist from 1982-91.

In 1989 Herzog sold his firm to **Huntingdon International** **Holdings Group** of the UK, who establuished an office in Petaluma. Huntingdon shut down their opeerations in 1996 and Kleinfelder acquired their assets and hired Novato office manager **Lyle Lewis** and much of his staff to form their new San Rafael branch office. Kleinfelder also moved Herzog’s Lab Supervisor **Terry McCue** to their geotechnical lab in Santa Rosa.

**Herzog Associates (1989-94); Herzog Geotechnical Consulting Services (1994-present)**

After selling Donald Herzog & Associates to Huntingdon, Don Herzog opened Herzog Associates as a specialized geotechnical consulting firm, mostly doing expert witness work. In December 1994 Don’s son **Craig W. Herzog**, GE (BSCE ’89 CPSLO; MS ’90 Berkeley) founded Herzog Geotechnical Consulting Services. He had previously worked for Huntingdon Engineering & Environmental, from 1990-94. The new firm was based in Mill Valley. **Donn Ristau**, PhD, CEG left Herzog in 1993 to establish **Phoenix Geotechnical** in Napa, and have provided engineering geology expertise to Herzog Geotechnical since their founding.

**John C. Hom & Associates (1988 – present)**

 Founded by **John C. Hom**, GE (BSCE ’72 Berkeley) in 1988 as a DVBE in California, after working for Herzog & Associates. The firm was based in San Rafael.

**Phoenix Geotechnical (1993-present)**

 Phoenix Geotechnical of Napa was founded in 1991 by **Donn Ristau**, CEG (BS Geol ’70 CSUN; MS ’73, PhD ’77 UC Davis) and **Robert D. “Bob” Broadhurst**, GE (BCE ’64 Manhattan College) both formerly with Herzog Associates. As of 2015, Ristau had retired and Broadhurst was continuing to operate the firm.

**Earth Science Consultants (1973 – unkn)**

After working for Harding-Lawson, **Jay A. Nelson**, GE (RCE 19738/GE 630) started Earth Science Consultants, Foundation and Geological Engineers, based in San Rafael, CA. Appearrs to have been a sole practitioner, and retired as of 2007.

**Subsurface Consultants, Inc.** **(1983-2002); Fugro West (2002-10); Fugro Consultants, Inc. (2010-present)**

Founded in 1983 by **Jim Bowers** (BSCE ’75, MS ’76 Berkeley) and **Bill Rudolph** (BSCE ’77, MS ’78 Berkeley), who both previously worked for the San Francisco office of Harding-Lawson Associates. The firm was based in downtown Oakland. Their principal clients included the Ports of Oakland and San Francisco, and the SFO Airport runway expansion. Bill succeeded as principal owner when he purchased ownership from Bowers in July 1994. Some of their key staff included **Don Gray**, (BSCE ’69 Utah; MS ’70 Berkeley), **Tom Cundey** (BS Muhlenberg; MSCE ’77 Berkeley), **Andrew Herlache** (BSCE ’82; MS ’84 Illinois), **Bill Wikander, Samuel Won**, and many others.

 In March 2002 Subsurface Consultants, Inc. (SCI) was purchased by **Fugro West, Inc.**, and reorganized as Fugro Consultants, Inc in 2010. Bill Rudolph took over management of Fugro's Onshore and Geotechnical Services. **Shah Vahdani**, PE (MSCE ’79 USC; PhD ’83 Berkeley) supervised earthquake and seismic site characterization work for Fugro worldwide until 2013, when he founded Applied Geodynamics. **Glenn Young** oversees Environmental Services in Northern California, and **Tony Dover** headed up Northern California Geotechnical Operations. Rudolph moved on within a few years and started **Land Marine Geotechnics**, after a stint at Treadwell and Rollo. Land Marine was subsequently purchased by ENGEO, and Bill Rudolph joined them as a principal geotechnical consultant. **Andy Herlache**, GE lead the geotechnical practice and **Thaleia Travasarou**, (BSCE ’97 Univ Athens; PhD GeotE 2003 Berkeley) took over the earthquake engineering practice (Jacob Chako having departed to start Fugro’s office in Turkey). Their operations moved to from Oakland to Walnut Creek in 2015 and co-located with the engineering geology practice (formerly William Lettis & Associates; see write-up above).

**A.L.B. Associates, Inc. (1984-97)**

Consultancy founded by **Albert L. Buchignani**, GE (BSCE ’57; MS ’68 Berkeley) in June 1984 and based in Mill Valley. While working for Harding Lawson Associates, he collaborated with Professor **J. Michael Duncan** at Berkeley to prepare a series of influential manuals and reports published by Berkeley’s Institute of Transportation & Traffic Engineering, in the Department of Civil Engineering, including: ***An Engineering Manual for Slope Stability Studies*** (released in March 1975); ***An Engineering Manual for Settlement Studies*** (released in June 1976); and ***Failure of Underwater Slope in San Francisco Bay*** (released in November 1973). Professor Duncan re-published the two manuals in October 1987 while he was teaching at Virginia Tech, which were still in print in 2005. These manuals had a significant impact on the state-of-the-practice for geotechnical engineering in the Bay Delta region from 1976 for the next few decades, being referenced frequently in reports. ALB Associates ceased doing business in March 1997.

**Van Houten Consultants (1986 - 2004)**

Founded by **Gary E. Van Houten**, CEG (BA Geol ’68 UCSB; MS UCLA) and based in Petaluma, after working for HLA. His project engineer was **Bill C. Wiggins**, PE. The firm did most of their work in Marin and Sonoma Counties. Van Houten ceased doing business around 2004 and accepted a position with the Oregon Department of Transportation in La Grande, OR.

**Trans Tech Consultants (1987-present); FileTeam.com (2010-present)**

Founded in December 1987 by **Bill C. Wiggins**, PE and based in Windsor, after working for Donald Herzog Associates and Van Houten Consultants. The firm’s principal focus was in geoenvironmental consulting, performing investigations, cleanups, and contracting services. In Jan 2010 he and **David M. Schissler** co-founded FileTeam.com to work on product development and visioning.

**Geospectra (1987-1994); J.P. Singh & Associates (1996-present)**

Founded in 1987 by Dr. **Jogeshwar Preet ‘J P’ Singh** (BSCE ’64 Thapar Inst; MS ’66; PhD ’81 Berkeley) after working for Dames & Moore (beginning in 1966) and Harding-Lawson Associates (where he directed their soils lab and field/geophysical testing). The firm was based in Richmond. Known to all of his colleagues as “J. P.,” Singh received his BSCE degree in India and MSCE in 1965 at UC Berkeley. He returned to Berkeley in the fall of 1976 and completed his PhD under Harry Seed in 1981.

In June 1993 two partners were added: **Mansour Tabatabai**, PhD, GE (PhD ’82 Berkeley) and **Richard C. Kent**, RG (BS Geol ’71 Oregon; MS ‘72 Portland State). They also used **Larry D. Porter**, RGP as their consulting geophysicist and **John M. Coyle**, CEG as consulting engineering geologist. Geospectra performed seismic assessment for ground motions on Golden Gate Bridge in early 1990s. The firm was purchased by **Kleinfelder** in August 1994 to increase their capabilities in geotechnical earthquake engineering. Within two years Singh left Kleinfelder to work as a private consultant, forming J.P. Singh & Associates in Richmond.

**Giblin Associates (1987-present)**

 Founded in 1987 by **Jere A. Giblin**, GE (1938- ) (BSCE ’67 Berkeley) and based in Santa Rosa. Previous to the start-up, Giblin began working for Harding Associates as a soils tech in 1964, advancing through the ranks to become manager of their Santa Rosa branch office when it opened in 1974.

**Gilpin Geosciences, Inc. (1996-2015)**

Established in 1996 by Dr. **Lawrence** **M.** “**Lou” Gilpin**, PhD, CEG (BA Geol ’79 Pennsylvania; MS ’82 Cornell; PhD ’95 UC Santa Cruz). Performed engineering geologic work for various geotechnical consultants in the Bay Area, including Treadwell & Rollo. At one time they expanded to three offices: San Rafael, Napa, and Walnut Creek, then were consolidated in St. Helena. Lou served as Chair of the *Geology & Public Policy Committee* for the Geological Society of America in 2005-06. In January 2015 Gilpin joined **Langan Treadwell Rollo** in San Francisco as their Chief Engineering Geologist, after serving as their contract geologist for the previous 18+ years.

**Treadwell & Rollo** (see write-up under Woodward Clyde threadline)

**Harlan-Miller-Tait** (see write-up under Dames & Moore threadline)

**Miller Pacific Engineering Group** **(1989-present)**

Founded in 1989 by **Eugene “Gene” A. Miller**, GE (BSCE ’51 Colorado A&M; MS ’56 Georgia Tech), who had worked for Dames & Moore (1956-58), before becoming a partner with Harding-Miller-Lawson (1958-73), senior vice president of Converse Ward Davis Dixon (1973-82), and partner with Harlan-Miller-Tait (1982-89). Gene served as a Navy Seabee officer during the Korean War (1951-53). He was a vociferous advocate of geotechnical engineers employing limitation-of-liability clauses in their contracts, which he described at continuing education seminars sponsored by ASFE and ASCE. The firm’s office was in Mill Valley, and later, in San Rafael. One of the early associates was **Glen A. Roycroft**, GE (BSCE ’80 Berkeley), who moved to Waste Management in 2000.

 **Scott A. Stephens**, GE (BSCE ’88; MS ’91 Berkeley) is the current president of the 20-person firm, with offices in Novato, Napa, and Petaluma. Scott’s early engineering years were at Dames & Moore’s San Francisco office. One of the other partners is **Michael P. Morisoli**, GE (BSCE ’92 Cal Poly SLO; MS ’95 UC Davis). In July 2009 **Dan Caldwell**, GE (BSCE ’78, MS ’80 Berkeley) joined the firm as an associate. The Novato office is staffed by **Rusty Arend**, GE and their engineering geologist is **Mike Jewett**, CEG (BA Geol 2008 Sonoma State).

**RGH Geotechnical & Environmental Consulting Services (1991-present)**

 Founded by **Gary W. Russey**, PG (BS Geol ’79 SDSU), **Keith Gregory**, and **Juan Hidalgo**, GE in 1991, and based in Santa Rosa. Russey came from Klienfelder, while Gregory and Hidalgo had worked for Harding Lawson. Hidalgo formerly owned **Hidalgo Associates**, a DVBM subsidiary of RGH. In 2008 they added **Eric G. Chase**, GE (BSCE ’89 Cal Poly SLO) as an associate. VPs include **Travis Whitted**, GE and **Jared Pratt**, CEG, and assisted by Project Geologist **Ryan Padgett**, PG.

**Hultgren-Tillis Engineers (1993-present)**

Founded in 1996 by **Edwin M. Hultgren,** GE (BSCE ’69 CSU Sac; MS ’71 Berkeley) and **R.** **Kevin Tillis**, GE (BSCE ’83 Illinois; MS ’86 Berkeley). Ed Hultgren worked for Woodward-Clyde from 1969-77 before joining Harding Lawson and managing HLA’s Honolulu office during the late 70s and 80s. Kevin Tillis worked for Lowney Associates from 1983-85, then for Harding Lawson. Their firm has always been based in Concord. They have an established book of business working on levees in the San Joaquin Delta. Senior engineers have included **Marlene K. Jackson**, GE, **Christian P. Mueller**, GE, **Steve K. S. Tsang**, GE, and **Jerry Hanson**, PE.

**Geotecnia (1996-present)**

 **Luis E. Moura**, GE founded the firmGeotecnia in 1996, as an MBE/DBE firm based in Walnut Creek. Moura’s degrees are BS in Eng Geoscience ‘82 and MSCE ’83, both from Berkeley.

**Earth Mechanics Consulting Engineers (1992-present)**

Founded by **H.** **Allen Gruen, Jr.**, GE of Harding Lawson Associates, around ~1992, originally based in Oakland, then Concord, then back to Oakland (as of 2007). Gruen holds BSCE (1980) and MSCE (1983) degrees from Purdue, where he worked with Prof. Milt Harr. Gruen had previously supervised Harding Lawson’s Geotechnical Lab in Novato.

**Gary Underdahl-Consulting Geotechnical Engineer (1990s-2009)**

 **Gary E. Underdahl**, GE (1942- ) (BSGeoE ’67 Minnesota) worked for Harding Lawson and Diablo Soil Engineers before launching his own consultancy in the 1990s, working out of Walnut Creek. He then worked for Questa Engineering in the 2000s, while living in San Francisco. It appears that he departed the SF Bay Area, and his engineering licenses were not renewed as of 2010.

**GEC Consulting Corp. (2005-16)**

Founded by **Marlene K. Jackson**, GE (BS Geol ’83 Harvard; MSCE ’90 Berkeley) as an SBE and DBE firm in September 2005, after working for Harding Lawson, Hultgren & Tillis, and Alan Kropp. Their office was in Pleasant Hill.

**Rockridge Geotechnical (2006 – present)**

 In 2006 **Craig Shields**, GE (BSCE ’81; MS ’82 Berkeley) departed Treadwell & Rollo in 2006 to form Rockridge Geotechnical as an SBE firm. Their office is in Oakland. Their senior engineers include **Linda H.J. Liang, GE** (BSCE ’97; MS ’98 Berkeley), and **Logan D. Medeiros, GE (BSCE 2004 CPSLO; MS 2007 Berkeley)**.

**Rollo & Ridley (2008 – present)**

 **Frank J. Rollo,** GE (BSCE ’87 Purdue; MS ’88 Berkeley) and **Christopher A. Ridley,** GE (BSCE ’96 Cal PolySLO; MS ’99 Berkeley) left Treadwell & Rollo in 2008 to form **Rollo & Ridley**, based in San Francisco. Frank is the son of Frank L. Rollo (co-founder of Treadwell & Rollo). Frank J. worked for Dames & Moore (1988-91) and Treadwell & Rollo (1991-2008) prior to the start-up. Chris worked for Treadwell & Rollo from 1996-2008.

**California Division of Highways/Caltrans threadline**

The Department of Highways was formed by the California Legislature in November 1896, when most of the state’s ground transportation were crude dirt roads maintained by county governments as well as some paved roads within the boundaries of the largest cities, such as San Francisco, Los Angeles, and San Diego. In 1907 the Legislature replaced the Department of Highways with the Department of Engineering, within which they created a **Division of Highways**. Voters approved an $18 million bond issue for the construction of a state highway system in 1910 and the first Highway Commission was convened in 1911. The first state highway projects began in August 1912, which also witnessed the founding of the Transportation Laboratory in Sacramento, which would garner national prominence in the years to come.

 In 1921, the Legislature changed the name from the State Department of Engineering into the Department of Public Works, which included the Division of Highways. Over the next half century the Division of Highways became the leading highway transportation authority in the United States, garnering many “firsts,” such as the painting of centerlines on highways statewide; first to build a freeway west of the Mississippi (the [Pasadena Freeway](http://en.wikipedia.org/wiki/Pasadena_Freeway)); the first to build a [four-level stack interchange](http://en.wikipedia.org/wiki/Four_Level_Interchange); the first to develop and deploy non-reflective raised pavement markers; and one of the first to implement dedicated freeway-to-freeway connector ramps for carpools. Most of this progress was chronicled in a State publication called ***California Highways & Public Works***, which was in print between 1927 and 1967.

In late 1972, the Legislature approved a reorganization (suggested by a study initiated by Governor [Ronald Reagan](http://en.wikipedia.org/wiki/Ronald_Reagan)), in which the Department of Public Works was merged with the Department of Aeronautics to become the **California Department of Transportation**, known simply as **Caltrans**. Caltrans operations are spilt into twelve districts statewide, with the Headquarters, Transportation Laboratory, and Bridge Engineering Group in Sacramento, and the rock slope engineering group based in San Luis Obispo.

**Caltrans Engineers and Geologists who transitioned to the private sector**

Many of the State’s most prominent transportation and structural engineers, as well as engineering geologists, have come from the ranks of the Division of Highways, Bay Toll Crossings and their successor agency, Caltrans. One of the most famous personages in pavement and geotechnical engineering was **O. James ‘Pappy” Porter** (1901-67), profiled below. Other Division of Highways personnel who went onto stellar careers in the private sector include: **Ralph A. Tudor** (founder Tudor Engineering Co.), **Donald R. Warren** (founder Donald R. Warren Co.), **Raymond O. Maurseth** (founder of Maurseth & Howe Foundation Engineers), **Leroy Crandall** (founder Crandall & Associates in Los Angeles), **Stanley D. Wilson** (founder of Shannon & Wilson), **Douglas C. Moorhouse** (CEO of Woodward Clyde Consultants), **Jack Rolston** (founder of Foundation Engineering Co.), **C.** **Lee Lowry** (founder of Lowry & Associates), **Alvin L. Franks** (founder of A.L. Franks Engineering), **Harry Cedergren** (renown seepage expert), **Ret Moore** and **Ray Taber** (founders of Moore & Taber), **Dick Frankian** (founder of R.T. Frankian & Associates), **Albert C. Gribaldo** (founder of Gribaldo, Jacobs & Jones and Earth Systems Consultants), **E. Duane Lyon** (CEO of the RMA Group); **Jim Kleinfelder** (founder of Kleinfelder & Associates), **Charles G.  “Mike” Bemis**, CEG (Chief Geologist Ninyo & Moore), **Tom Wallace** (founder of Wallace-Kuhl Associates), **Ron Carducci** (founder of Cal-West Consultants), **Gerry Diaz** (founder of Diaz-Yourman Associates), **Abel Soares** (founder Soares Geotechnical), **Herb Volin** (founder of Diablo Soils Engineers), **Douglas J. Kuhl** (co-founder of Wallace Kuhl & Associates), **Alan L. Kropp** (founder of Kropp & Associates), and **Robbie M. Warner**, GE (co-founder of Geo-Logic). Engineering geologists who began their careers at the Division of Highways included **Bruce D. McCreary** (founder of McCreary-Koretsky Engineers); **Jack T. Eagen**, CEG (Sr VP at Moore & Taber), **Charlie Marek**, CEG (pioneering work with hydraugers), **James H. Gamble**, CEG (Chief Geologist of PG&E), and **David G. Heyes**, CEG (partner at Geo-Risk Associates).

**O.J. Porter & Co. (1942-55); Porter-Urquhart & Associates (1950-53); Porter & O’Brien (1952-67); Porter, Urquart & Beavin (1953-57); Porter, Urquhart, McCreary & O’Brien (1955-60); Porter, O’Brien & Armstrong (1962-65);** and **Porter, Armstrong, Ripa & Associates (1962-67)**

 **O.J. Porter & Co.** was founded by **Omer James “Pappy” Porter** (1901-67) of the California Division of Highways in Sacramento, in early 1942. Porter was a third generation Mormon born in Mt. Pleasant, Utah on November 28, 1901. He attended Alberta Agricultural College in Olds, and then transferred to the University of Alberta, receiving his BSCE degree in 1924. He took a part-time position with the California Division of Highways in 1924, mixing and testing concrete specimens in Sacramento. The quality of his work and his enthusiasm for tinkering soon landed him a full-time position in the transportation lab.

Porter went onto to serve as Associate Physical Testing Engineer, then as Staff Materials and Research Engineer for the State Division of Highways in Sacramento, under the direction of Materials & Research Engineer **Thomas E. Stanton**, PE (BSMinE 1904 Berkeley). Their collaboration was one of the most prolific in pavement design and geotechnical engineering.

Between 1927-30 Porter developed the **California Bearing Ratio** (CBR) and soil swell tests, building on his relative compaction test. The CBR test measured penetration of compacted soil to evaluate the relative stiffness of pavement subgrades and base courses, by comparing the penetration resistance of these materials with that of crushed limestone. The stated intent of the CBR test was to evaluate the load bearing capacity of the pavement subgrade.

In 1928-29 Porter then developed the nation’s first compaction test procedure for the Division of Highways, a simple device and scheme that measured a soil’s wet unit density and determined the optimum moisture content, using a very similar scheme to that made famous by Ralph Proctor five years later, in 1933. Known as the “California impact compaction test” or the “relative compaction test,” it is still used by Caltrans as **California Test Method 216** (described in T.E. Stanton, 1938, Highway Soil Studies: *Calif Hwys Pub Wks*, v14:6 (June), pp. 12-14; and in T.E. Stanton, 1938, Soil Stabilization, *Calif Hws Pub Wks*, v14:7 (July), pp.12-15).

In the early 1930s Porter also pioneered the use of sand [wick] drains, which were installed on the eastern approaches to the San Francisco-Oakland Bay Bridge in 1933-35, along with standpipe piezometers to record pore pressure induced by the fill surcharge. These are generally considered the first successful employment of wick drains in the United States (see Porter, O.J., 1936, Studies of fill construction over mud flats: *Proc. Int’l Conf Soil Mech & Fdn Eng*, Cambridge, v. 1:229-235).

Between 1930-47 Porter developed a series of retractable plug piston samplers in an array of sizes, between one and four inches in diameter, and between 1.5 and three feet long. They were initially known as “**Porter Type Soil Samplers**,” then as “**Porter Tube Samplers**,” or simply “**Porter Samplers**.” Competing drive samplers (without retractable plugs) were developed by Moran & Proctor, the Gow Division of Raymond, Sprague & Henwood, Dames & Moore, and the patented Pitcher Sampler developed by John Pitcher in South San Francisco (see descriptions under “Evolution of Porter Soil Samplers 1930-47”).

In 1942, soon after the United States entered the Second World War, Porter formed his own consulting company, **O.J. Porter & Co.**, specializing in soils, pavement design, and foundation engineering, based in Sacramento. Pappy Porter did a lot of consulting work for the Navy’s Bureau of Yards & Docks and the Army Corps of Engineers (which continued through 1964). He also became the central figure of the Corps of Engineers ***Airfield Pavement Design Advisory Council***, providing advice on a program of extensive pavement tests at the “Stockton Test Track” at Stockton Airfield, south of Sacramento, which led to the development of Flexible Pavement Design Manuals and the Modified Proctor Compaction Test in 1945. Porter was also dispatched by the Army to Guam, Saipan, and Tinian in 1944 to advise the Corps of Engineers on airfield construction for the B-29 Superfortress bombers. In 1946 Porter began submitting patent applications for a number of devices, including a massive 240 ton rubber tired “supercompressor,” intended to increase the insitu density of pavement subgrade for airfields.

In 1947 Porter established an east coast office in Montclair, New Jersey to work on the soil settlement problems in the New Jersey Meadows area, during construction of the New Jersey Turnpike. In the post-war period Porter employed sand drains and surcharge embankments to allow development of settlement-prone wetlands, similar to the technique he used in the early 1930s. His business quickly expanded, and the following year (1947) he was recommended by Professor **Ralph Peck** to mitigate similar soft soil problems in some peat deposits adjacent to Chicago’s new O’Hare Field, just beginning construction. At that time the soils had some of the lowest CBR values imaginable for a major airport runways (CBR = 3, 4, or, at most, 5), so Porter became an integral member of the airport consulting team (which included Ralph Burke, Ralph Peck, Nate Newmark, R. R. “Bob” Philippe [Corps of Engineers-Cincinnati], and Chicago engineering geologist George Otto).

 Around 1949-50 Porter moved their East Coast office to Newark, New Jersey where that office provided consulting services on a wide range of projects beyond the New Jersey Turnpike, including the Ohio Turnpike, the Garden State Parkway, the Connecticut Turnpike, the Northern Illinois Toll Highway, Interstate 71 in Ohio, Interstate 81 in Virginia, Newark Airport, LaGuardia Airport, and New Jersey’s Round Valley Reservoir.

In addition to the original office in **Sacramento**, branch firms/offices were established in **San Francisco** (working on Interstate 15 in Utah, the Port Chicago Ammunition Depot, San Francisco Int’l Airport, and many others) and **Los Angeles** (see the Los Angeles area threadline), as well as overseas field offices, mostly associated with defense design and construction contracts. Porter eventually maintained offices in Sacramento, San Francisco, Los Angeles, Montclair, NJ, and later, Newark, NJ, up thru his untimely death, in December 1967. **Porter-Urquhart** was the firm name used in the Newark-New York City area, from 1950-53, when Porter formed his first partnership, with retired Corps of Engineers Colonel **Leonard C. Urquhart** (1886-1960; BSCE ’09 Cornell), who taught engineering at Cornell between 1914-42 (also author of the original *Civil Engineer Handbook*, which appeared in three editions during the 1940s and 50s). This became **Porter, Urquart & Beavin**, when he took on partner **Benjamin E. Beavin**, PE (1902-1981), a civil engineer from Maryland. The last firm name employed from the east coast office in New Jersey was **Porter, Armstrong, Ripa & Associates,** formed in 1962 with **Ellis Leroy Armstrong** (1914-2001), who had recently stepped down as Commissioner of Public Roads in the Eisenhower Administration, and architect **George Ripa** (1902-unkn), who had previously practiced in New Jersey and Maryland.

A separate entity with the same Newark address, named **Porter & O’Brien,** was incorporated in New Jersey and California in 1952, between Porter and civil engineer **Kenneth O’Brien**. They offered full architectural-engineering design services for military installations, targeting work with the Army Corps of Engineers and Department of Defense, mostly on overseas airfields (e.g. Morocco). O’Brien then moved to Los Angeles to manage the Los Angeles office of **Porter, Urquhart, McCreary & O’Brien** in 1952, which became **Porter, O’Brien & Armstrong** in 1962 (see below), and continued operating through 1968.

 The principals listed in the Sacramento office in 1952 included **Porter**, **W.H. Jervis**, and **Bruce McCreary**, with senior associates **G. D. Potts**, **R.W. Brandley**, and **E.M. Shay**. **O.J. Porter & Co** operated until 1953, when each office became a separate partnership. In March 1953 **C. Lee Lowry** (BSCE ’51 Berkeley) joined the firm, working out of their Bay Area and Sacramento offices until April 1960, when he formed a partnership with **Bruce McCreary** and **Leland Roberts** (described below under Lowry & Associates). Porter’s sister offices continued operating in San Francisco and Los Angeles for many years thereafter, using the same addresses. One of their earliest Bay Area employees was **Earle Klohn** (BSCE ’50, MS ’52 Univ Alberta) from Winnipeg, who joined San Francisco office in 1952 (he went onto found Klohn-Leanoff in Vancouver, BC then joined Charles F. Ripley [MSCE ’46 Harvard], and later, became professor of soil mechanics at Alberta).

 In Jan 1955 the federal government sued Porter-Urquhart and Skidmore, Owings & Merrill for collusion in the manner they purchased stationary and other paper goods using a cost-plus fixed fee basis during the construction work in North Africa, and prevailed. O.J. Porter & Co. and Porter-Urquhart ceased doing business after the judgment was sustained in the appellate court.

 **Bruce D. McCreary** had been an investor in the Porter partnership that designed overseas air force bases in Morocco for the US Air Force in the early 1950s. He was a geology and ROTC graduate of Stanford in Dec 1939 and served as a combat engineer officer in the Army during the Second World War. After the war he joined the California Division of Highways, employing the techniques Porter had pioneered to construct highway fills across soft soils. Porter hired him to work in his Montclair, New Jersey office in 1948, where he supervised the firm’s work on the New Jersey Turnpike.

In the fall of 1955 Porter formed another partnership with **McCreary** (registered as RCE 8778 in CA in 1953) and **Ken O’Brien** (registered as RCE 8523 in 1952), called **Porter, Urquhart, McCreary & O’Brien** (PUMO), operating out of offices in Newark, New Jersey, Sacramento, Los Angeles, and San Francisco. The Sacramento, LA, and SF offices engaged primarily in west coast public works projects (transportation and water resources), while the New Jersey office continued working on overseas airfield projects and domestic transportation projects along the eastern coast and Midwest. **Bernard B. Gordon,** PE (BSCE ’36 MIT) worked for PUMO out of their 1140 Howard St. San Francisco office in the mid-1950s, before joining the California DWR (he went on to serve as the senior geotechnical engineer on the Oroville Dam Project in the late 1960s). Their principal emphasis was on transportation projects, including bridge design, but some of their projects included feasibility studies on the American and Yuba River basins.

 In the latter half of 1962 Porter brought in fellow Mormon **Ellis Leroy Armstrong**, PE (1914-2001) (BSCE ’36 Utah State) to become a partner in **Porter**, **O’Brien & Armstrong** incorporated in California, with Porter listing himself as “managing partner.” Armstrong had recently stepped down (March 1961) as Commissioner of the U.S. Bureau of Public Roads in the Eisenhower Administration, then served as president of the Better Highways Information Foundation in Washington, DC in 1961-62. **Porter, Armstrong & Ripa Associates** was the name of the firm incorporated in Newark, New Jersey. The firms continued to operate from their offices in Newark, Sacramento, San Francisco, and Los Angeles, bidding highway and defense work across the nation.

The San Francisco office operated as **Porter, O’Brien and Armstrong** (POA) between 1962-68.  **Richard Appuhn**, PE, CEG (BSCE ’62; MS ’63 Berkeley) worked for POA in 1962, and was succeeded by **Francis A. Stejer**, CEG, who worked for POA in the early 1960s, when their work focused primarily on highways (he went onto Dames & Moore). Porter, O’Brien & Armstrong appears to have continued operating in San Francisco until about 1965.

The Sacramento office operated under the name **Porter, O'Brien, Consulting Engineers** until February 1966.  That year the name of the Sacramento operation was changed to **Porter, Armstrong, Ripa & Associates**, the same as that of the Newark, NJ office. Pappy Porter's son, **James Porter** (1928-1987), was the Vice President of his father's companies at that time, and managing the Sacramento office. On December 18, 1967 Pappy Porter died at age 66 in Madison, New Jersey. A few months later **Jim Kleinfelder** made his first acquisition of another firm, purchasing the assets of Porter, Armstrong & Ripa’s office in Sacramento. **Ellis Armstrong** operated **Armstrong & Associates** for about a year before being named U.S. Commissioner of Reclamation by President Nixon, between 1969-73.

**McCreary-Koretsky Engineers (1960-70);** **McCreary-Koretsky International (1970-74)**

 In April 1960 **Bruce David McCreary** (1917-2012) (BA Geol ’39 Stanford) left PUMO and joined with **Sanford “Sandy” Koretsky** (1915-82) to form **McCreary-Koretsky Engineers**, a civil-structural-construction management firm, based at 1140 Howard St. in San Francisco (Koretsky was registered as RCE 7122 in 1947). The firm’s focus was on transportation and water resources development, esp. the five hydroelectric power plants constructed along the Middle Fork of the American River for the Placer County Water Agency between 1957-67. They also entered into several joint venture water resources projects in northern California and southern Oregon with Clair A. Hill & Associates of Redding (which became CH2M-Hill in 1971). Some of their senior staff included engineer **Merih Kazmirci** in San Francisco and geologists **Eugene A. Hainze,** **Herbert Bensinger** and **Richard C. ”Dick” Thompson**,CEG(1929-99), who joined the Corps of Engineers SF District in 1965, and **Keith A. Howard** (BS GeoE ’61; MS ‘62 Berkeley; PhD Geol ’66 Yale; who worked for the USGS in Menlo Park 1966-2006. The geologists worked out of their field office in Auburn. The firm’s major work was on the Placer County hydroelectric projects along the Middle Fork of the American River. The firm’s project manager at the Auburn field office was **James A. Conwell**, PE (1911-77) (BSCE ’33 Berkeley), who oversaw the construction of Hellhole Dam, which was severely damaged during its construction by the record storms of December 1964 and January 1965. McCreary moved to Auburn in 1965 to be closer to the Middle Fork projects, then to Rocklin, and finally in Auburn, where he remained the rest of his life. Sanford Koretsky ran the firm’s home office in San Francisco, where most of the design work was performed.

 In 1960-62 McCreary served on the ***Special Advisory Committee on Criteria for Hydraulic Fills*** chaired by Prof. George F. Sowers, which authored Report No 25 to the Federal Housing Administration by the Building Research Advisory Board of the National Research Council, presumably, from his involvement with hydraulic fills along the margins of the San Francisco Bay and other coastal locations with which he become familiar. In the late 1960s the firm began peforming an increasing volume of overseas work, establishing offices in Honduras, Ghana and Dahomey in Africa, and Laos and Cambodia in Southeast Asia.

 In 1970 McCreary and Koretsky retired because McCreary-Koretsky faced bankruptcy charges stemming from income taxes due to the federal government and a lawsuit brought by against them by the Placer County Water Agency, because of the untimely failure of Hellhole Dam on the Rubicon River in December 1964, while the dam was under construction. **McCreary-Koretsky International, Inc.** (MKI) was formed as a wholly owned subsidiary of Louis Berger, Inc. of New York (which had been purchased by Leasco Corporation in 1969), to acquire the contracts and personnel of McCreary-Koretsky Engineers (MKE) as part of a reorganization agreement. MKE was to be paid a percentage of the profits made by MKI on the acquired MKE contracts. The reorganization agreement was closed on September 16, 1970, effective as of April 1, 1970. Berger attorney Peter T. Taussig and Leasco attorney Frederick A. Jackson attempted to purchase MKI in 1971, but changed their minds after learning that the firm was losing money because of some problems with the Miller-Sweeney Bridge carrying Fruitvale Avenue from Oakland to Alameda (a four-lane singleleaf Bascule Bridge, completed in Dec 1973). A breach-of-contract suit was brought against them by Leasco, which was sustained by the court, and Leasco (a Delaware corporation) retained ownership of MKI, which remained in business a few more years, until 1974. Bruce McCreary passed away in Oct 2012 at the age of 95.

**Harry R. Cedergren, Consulting Engineer (1967-96)**

 **Harry R. Cedergren**, PE (1911-96) was a native of West Seattle and received his BSCE degree from the University of Washington in June 1937, graduating cum laude. At Washington he had been exposed to soil mechanics by Professor **Robert G.** “**Bob” Hennes**, one of Karl Terzaghi’s students at MIT in 1928-29. Based on Hennes’ recommendation, Cedergren enrolled in graduate studies in soil mechanics at Harvard University under Terzaghi’s protégé Prof. Arthur Casagrande, receiving his M.S. in June 1938. In January 1939 he joined the Portland District of the Army Corps of Engineers and authored his first paper on *“****Utility* *of the Flow Net in Stability Analysis***” for the 1940 Purdue Conference on Soil Mechanics. He worked for the Corps on a variety of dams and airfield projects in the Pacific Northwest during the Second World War.

He became a registered civil engineer in California in July 1946, and moved to California in 1948, accepting a position as traffic engineer with the City of Stockton. He then accepted a position with O.J. Porter & Co. in Sacramento. In 1951 he joined the Transportation Laboratory of the California Division of Highways in Sacramento, where his focus shifted to pavement design. At the 1962 *Conference on* *Structural Design of Asphalt Pavements* at the University of Michigan he and Wentworth Lovering co-authored a landmark article that proposed asphalt stabilization of permeable underdrains, which led to the employment of free-draining aggregate subgrades under pavements. Among his many contributions was the establishment of Caltrans Class II Permeable (subdrainage) Mixture in California Division of Highways *Standard Specifications* volume in 1958, which limited the percent fines (passing the #200 sieve) to between 0 and 3% by weight. This mixture became the “standard subdrain mixture” for decades thereafter. In 1963 he moved to the California Department of Water Resources, during construction of the major elements of the California Water Project, such as Oroville Dam.

 In 1967 he retired from state service because he was no longer performing engineering work, but supervising younger engineers. He remained in Sacramento and established himself as an independent consulting engineer. That year he also completed the first edition of his textbook titled “***Seepage, Drainage, and Flow Nets***,” published by John Wiley & Sons. The classic text was revised in 1977, and enlarged and revised again, in 1989. In 1974 he published his second book, titled “***Drainage of Highway and Airfield Pavements***,” with a second edition appearing in 1987. In 1970 he received an FHWA research contract to investigate pavement subdrainage practices, nation-wide. This effort resulted in the FHWA’s “***Guidelines for the Design of Drainage Systems for Highway Structural Sections***,” which appeared in 1972. The subdrainage tenants of these guidelines were subsequently incorporated into the 1986 AASHTO Pavement Design Guidelines. In 1973 he prepared the chapter titled “***Seepage Control in Earth Dams***” for the Casagrande Volume on ***Embankment Dam Engineering***, considered one of the preeminent texts on that subject. Cedergren is considered to be the “father of subdrainage,” and if not the father, he was certainly the most respected prophet of the craft.

**Herbert R. Volin**, GE started Diablo Soil Engineers in 1974 (described in the Harding threadline), after having worked for Harding-Miller-Lawson and Caltrans.

**David G. Heyes**, CEG (BA Geology 1960 Whittier; MS Env Geol CSU Hayward) was an engineering geologist with CA DWR and Caltrans for almost three decades, beginning around 1960, in Los Angeles. He retired from Caltrans District 4 in San Francisco around 1988. He lives in Fremont and has worked part-time with Leo Devito, CEG for many years on a wide range of consultations.

**Abel R. Soares & Associates (1972-90)**

 **Abel R. Soares**, GE (BSCE ’60 Humboldt State) grew up in the Modesto area and attended Modesto Community College and Humboldt State, before joining the California Division of Highways in the District 4 ofice in San Francisco in the summer of 1960. He became registered as a RCE in 1968 and GE in 1987. He left Caltrans in 1972 to start his own geotechnical firm, bulding his own low-clearance tracked drill rig which employed a small diameter retractable plug Porter Tube style sampler (see description above, under O. J. Porter). Soares worked out of yards he maintained at various times in San Pablo, Pinole, and El Cerrito. He also served as a drilling subcontractor for many East Bay geotechnical firms, back in the days when few drillers offered low-clearance rigs that could be set up in tight places. He incorporated as Abel R. Soares & Associates in March 1979.

 Soares departed the Bay Area in 1990 to manage the **U.S. Testing Co**. in Oakdale, but this association only lasted about a year. In 1991 he rejoined Caltrans at their District 10 office (1992-95), then transferred to their Office of Structural Foundations in Sacramento, where he worked between 1995-2000. In 2000 he retired from Caltrans and began managing the Modesto office of **North American Technical Services**, a geotechnical and materials testing firm.

**Kleinfelder threadline** (in Caltrans thread)

**Stockton Testing & Controls (1961-66); J. H. Kleinfelder & Associates (1966-85); Kleinfelder West (1985- present)**

 **James H. Kleinfelder**, GE was born in November 1934 in Pittsburgh, PA. He received his BSCE degree from U.C. Berkeley in 1956, and worked for the California Division of Highways, the City of Stockton, and Johns-Manville Corp. During his tenure as a resident engineer for the City of Stockton, he experienced difficulty hiring of soils testing firms based out of Sacramento, who were so busy they weren’t servicing Stockton in a timely manner. In 1961 Jim took $1500 savings and along with his brother Ed started **Stockton Testing & Controls** to serve the San Joaquin County market. In 1963 he bought out his brother’s share and established the firm’s first branch office in Merced. Jim also returned to Berkeley to secure a master’s degree in soil mechanics in 1963-64, while still running the firm.

 In 1966 he changed the name of the firm to **J.H. Kleinfelder & Associates**. In 1968 they purchased the assets of Porter, Armstrong & Ripa in Sacramento, after O.J. ‘Pappy’ Porter died in Dec ’67. In this acquisition they picked up **Michael E. Mahoney**, who managed the Sacramento office. The firm was unusual in that they owned and operated their own drilling rigs longer than many other firms. They began doing international work in Beirut in 1968, and ventured into Saudi Arabia in 1974.

 In 1970 the firm opened its third branch office in Fresno, managed by **Cyril M. “Bud” McRae**, CEG, GE (BSCE ’62, MS ‘79 Berkeley), and assisted by **Michael V. Smith**, CEG (BA Geol ’70 CSU Fresno). A fourth office was established in Walnut Creek in 1971, where **Michael E. Mahoney**, GE (1937-2001) served as the first office manager (also serving as ASFE President in 1990-91). In 1975 they acquired a local firm in Reno and established another branch office there. **Ron Heinzen**, GE (BSCE ’73; MS ‘74 UC Davis) managed their Stockton office for many years.

 In 1979 they relocated their corporate headquarters from Stockton to Walnut Creek. Kleinfelder created and implemented strategic plans in the late 1980s that allowed it to expand dramatically over the next two decades, into the Los Angeles and San Diego areas in the 1980s. In 1982 the firm expanded their operations into southern California, and leveraged all of the firm’s service for the first time on the Squaw Creek Project at North Lake Tahoe, beginning in 1983. During this time (1983-84) Kleinfelder also served as President of ASFE, and of the Hazardous Waste Action Coalition (in 1989-90). In 1985 the firm expended to include geoenvironmental assessments, and in 1985 **Kleinfelder West, Inc**. assumed ownership of the operations in the western United States (Kleinfelder Central, Kleinfelder Southeast, and Kleinfelder East being established over the next 15 years, overseeing their respective regions of the country). In 1988 Kleinfelder established regional branch offices in Washington, Arizona, and Utah and acquired Mandeville & Associates of southern California to leverage their services in air quality and solid waste management.

 In 1989 Kleinfelder established an Employee Stock Ownership Plan (ESOP) to transition ownership and enable their employees to share in firm’s financial success. Kleinfelder ended the 1980s with almost **600 employees and $37 million in annual revenues. Bud McRae** took over the reins as president in 1989, and became CEO in 1993 when Jim Kleinfelder retired.

 In 1994 the firm expanded its operations into Mexico and purchased Geospectra from J.P. Singh. **Zia Zafir**, GE (BSCE ’83 Taxilla-Pakistan; MS ’87 Iowa State; PhD ’93 UNR) joined Kleinfelder as part of this acquisition and became Chief Engineer and Practice Leader in seismic and geotechnical earthquake engineering, in Sacramento. Some key Bay Area personnel included managing partner **Ed Rinne** (BSCE ’61, MS ’63 Berkeley), who left Dames & Moore in 1984 to manage the corporate office before taking over the reins as geotechnical discipline leader from 1986-2006, **Lyle Lewis** (from Harding Lawson), **Mike Majchrzak** (1953-2009; from Lee & Praszker), and **Terrance K. L. Wang** (MSCE ’76 Berkeley), who came from McClelland Engineers in Texas to serve as the regional manager in Pleasanton (1986-2002). **Brian O’Neill**, GE (BSGeoE ‘85 UNR) left Harding Lawson in 2002 to become principal geotechnical engineer at the Oakland office. **Bill McCormick**, CEG (BS Geol ’83; MS ’86 SDSU) joined in 1995 and became the senior principal geologist in the San Francisco Bay Region, out of Santa Rosa. **Gregory Ruf**, GE (BSCE ’79 SJSU) managed Klienfelder’s geotechnical operations in the South Bay region from 1986-2001. By 1996 Kleinfelder had 21 offices in California.

 In 1997 **Gerald J. Salontai**, GE (BSCE ’77 Cal Poly Pomona; MS ’81 CSULB) became the firm’s third CEO. He joined Kleinfelder in 1981 and witnessed its transformation from a central Californian to coast-to-coast entity. In 1998 they acquired Lincoln Devore, Inc. with offices in Colorado Springs and Pueblo, Colorado. In 1999 the firm moved its national headquarters to San Diego, with Salontai continuing as President and CEO until 2009. In 1999 they acquired Trinity Engineering and Testing, with 13 offices in Texas. Kleinfelder concluded the **1990s with 1,200 employees and about $92 million in annual revenues.**

**In 2002, Kleinfelder expanded its operations into the Midwest by acquiring** GeoSystems, Inc. In 2004 they acquired controlling interest in Kakona [Insurance Co.](http://www.kleinfelder.com/index.cfm/about-us/historical-timeline/) as a captive carrier for a variety of insurance lines. In 2005 they established an East Coast presence by acquiring Geologic Services, Inc. In January 2006 the firm expanded its operations along the Mid-Atlantic States, from Philadelphia to Florida, through the acquisition of Powell-Harpstead. In 2008 they established satellite offices in the Carolinas by purchasing Trigon Engineering. In 2010 the firm established the ***James H. Kleinfelder Fellowship*** ***in Geotechnical Engineering***, which grants $10,000 per annum to deserving students at U.C. Berkeley. In 2012 Kleinfelder was included in the innaugeral class of the Academy of Distinguished Alumni at Berkeley.

In 2009 **Bill Siegel** (BSCE ’84; MS ‘86 Nevada-Reno) succeeded Salontai as Kleinfelder’s fourth CEO. In 2010 they expended their operations into Guam and Australia and acquired Buys & Associates and LPG Environmental & Permitting Services, expanding their operations in Florida, Utah, and Colorado. In 2011 they purchased InSite Environmental of Stockton, and in 2012 Corrigan Consulting of Houston, Texas. In 2012 Kleinfelder also opened an office in Calgary, Canada. **George J. Pierson**, PE serves as the firm’s current CEO.

Before the October 2008 recession, Kleinfelder had 70 plus offices nationwide and 2000+ employees. By 2011 these figures had decreased to 54 offices and 1,850 employees, in the US, Australia, and Guam. **R.** **Jeffrey Dunn**, GE (BSCE ’75, MS ’76, PhD ’83 Berkeley) joined the Walnut Creek office in 1985 to head up their geoenvironmental practice and departed in 1991 to open an office for Geosyntec, but rejoined Kleinfelder from 2002-13. He served as technical director of their levees and dams practice, working out of the Oakland office. From 2010 **Chris Nardi**, GE (MSCE ’81 Berkeley) served as Principal Geotechnical Engineer of the Oakland office, followed by **Robert Fosse** GE, who previously worked for Harding ESE and ARUP before coming aboard in 2006. **John S. Lohman**, GE (BSCE ‘82 CalPolyPomona; MS CSULB) served as the firm’s technical discipline leader in geotechnical and geological engineering, working out of the San Diego office. From 2009-15 Kleinfelder West’s principal engineering geologist was **Bruce R. Hilton**, CEG (BA Geol ’78; MS work CSULA),working out of the firm’s Sacramento office (Hilton also served asAEG President in 2010-11). **Kleinfelder West** presently employs an aggregate staff of about 1,100 people. In Nov 2015 Siegel stepped down as CEO and Senior VP **Kevin Pottmeyer,** PG was named Interim CEO.

**DCM/Thomsen Consultants (1983-89); DCM/Joyal Engineering (1989-2000); DCM Engineering (2000-09); DCM/GeoEngineers (2009-11); DCM Consulting, Inc. (2011-present)**

 Founded in February 1984 by **David C. Mathy**, GE (BSCE ’76 CSPU Pomona; MS ’79 Berkeley) and **Neil A. Thomsen**, GE, CEG (BS Geol ’76 Minnesota-Duluth; MSCE ’81 Berkeley) in Walnut Creek. Both had previously worked for Kleinfelder in Walnut Creek. Thomsen had worked in the mining industry in British Columbia prior to completing his undergrad degree at Duluth, and he left the partnership in 1986.

**Norman A. Joyal**, GE (BSCE ‘78 CPSU-SLO; MSCE ’79 Berkeley) succeeded Thomsen as a principal/partner for next 11 years, while the firm was known as **DCM/Joyal Engineering**. In 2000 Norm departed and worked for Cal Engineering & Geology, before founding his own construction company.

The firm was then renamed **DCM Engineers**. Their senior staff included **Robert A. Kahl**, GE, **Dru R. Nielson**, CEG (BS Geol ’86; MS ’88 BYU), **Marc M. Gelinas**, **Brian R. Dodge**, and **Mark Sinclair**. They specialized in soft ground micro-tunneling and ‘trenchless technology,’ mostly for sanitation districts and water agencies. In 2009 the firm was purchased by **GeoEngineers** of Seattle, becoming **DCM/GeoEngineers**. In 2011 Dave Mathy formed **DCM Consulting**, **Inc**. based in Lafayette.

**Balbi & Chang Associates and BNC Testing Labs (1982-98)**

 Founded by **Gary C. Balbi,** QE (1946-2007) and **Philip L. Chang**, GE (BSCE ’74 Berkeley) in March 1982 and based in Cordelia, and later in Fairfield. Around 1965 Balbi began as a soils tech for R.W. Brandly Engineers for the Stockton Municipal and Sacramento Int’l Airports. In 1969 he joined Kleinfelder’s Stockton office as their senior soils technician. **Balbi & Chang** ***was the first geotechnical firm based in Solano County***, serving the Fairfield-Vacaville-Cordelia area. They also performed pavement, concrete, and soils testing work in Solano, Yolo, and Napa Counties. They grew with the rapidly expanding area until the Rancho Solano lawsuits forced them to close down in the late 1990s. Balbi took a position as VP of construction services for **Smith Emery** **Co.** in Sacramento, then founded **Matriscope** with Robert Tadlok in 2003. He died of cancer in June 2007. Balbi and Chang also owed **Bay Area Exploration, Inc**, a drilling company. Philip Chang went onto found **Tong & Chang Consultants, Inc**. based in Suisun City, but is no longer in business.

**Gribaldo, Jacobs & Jones et al threadline**

**Hersey Inspection Bureau (1946-64)**

Around 1946 **James H. Dunn**, PE established the **Hersey Inspection Bureau** in Oakland, offering inspection and testing services, mostly for pavement and materials testing. This expanded to include soils testing, beginning around 1950. In April 1958, William F. Jones, PE, along with were **Al Gribaldo** (BSCE ’49 Berkeley), **Alvin Rathbun**, and **George R. Thenn, Jr.**, purchased Hersey Inspection Bureau to establish themselves in the East Bay market. Rathbun oversaw the business side of the various testing firms. Shortly afterward, they established a branch office in Concord, managed by **Gery Anderson** (more information provided in the Soil Testing firms threadline, above).

**Testing & Controls (1954-75)**

 Around 1954 **Testing and Controls** of Mountain View was founded by **L.** **Cedric Macabee**, PE (1903-83), who owned Macabee Engineering in Palo Alto, a firm that specialized in water resources and sanitary engineering in northern California. He hired **Albert C. Gribaldo**, PE from the California Division of Highways to run this office. Al was a 1949 graduate of Cal Berkeley in civil engineering, who had been working on the construction of the Nimitz Freeway (State Route 17) in the East Bay, and was an expert engineering draftsman. He was assisted by **Chuck Sillkock**, a surveyor from Macabee Engineering, who supervised the testing lab. The lab included a moist curing room for storage of concrete cylinders before testing. The on-call engineers who worked part-time for the firm were **Myron Jacobs** at Santa Clara University and **Jorge Barringa** of San Jose State. The soils technicians were **John P. Nielsen** and **Loren Saliday**. Nielson was also a CE student at San Jose State (he departed in the fall of 1957, to complete his MS at Wyoming and PhD in geotechnical engineering at Colorado before returning to the peninsula to work for Gribaldo in 1961).

 Testing and Controls rented space in the building on San Antonio Road in Mountain View owned by **Peninsula Laboratories**, a full service commercial assay (minerals and petroleum) and testing firm, which also provided medical, chemical, botanical, and pharmacutical testing. In February 1958 **William F. Jones**, PE (MSCE ‘50 Caltech) resigned his position with Skidmore, Owings and Merrill and became a principal at Testing & Controls. In 1959 **Alvin A. Rathbun** (MBA ’57 Stanford) joined the firm as its business manager and the company moved to larger quarters in a building near Moffett Field.

In 1971, **Dan Rhoades**, PE was a principal of Gribaldo Jones & Associates when he was also named President of Testing & Controls, and a branch office was established in Concord to serve the growing Contra Costa County market. The other principals were **Robert D. Dewell**, PE, SE as Vice President and Chief Engineer, **Richard L. McKillip** as Manager of Business Development, and **Donald Peard Kay**, PE as Staff Engineer. In 1975 Rhoades departed to start **Purcell-Rhoades & Associates** in Pleasant Hill, and the Concord office of Testing & Controls was closed.

**Jones, Thenn & Associates (1958-61)**

 In November 1958 **Bill Jones** and **George R. Thenn, Jr.** established **Jones, Thenn & Associates** as a soils and foundation engineering company in Mountain View. Hersey continued working in the East Bay into the early 1960s, until it was absorbed by **Gribaldo, Jacobs & Jones** (GJ&J), described below.

**Peninsula Testing & Controls (1959-69)**

**Peninsula Testing & Controls** was founded by **Albert C. Gribaldo** and **Alvin A. Rathbun**, (1922-2011) around 1959. Rathbun had undergraduate degrees from Middlebury College in Vermont and Stanford (Class of 1950). After earning his MBA from Stanford he assumed the role of Secretary-Treasurer of Testing & Controls, Peninsula Testing & Controls, GJJ, and later, the Earth Systems firms. **David M. Wilson** was the senior engineering geologist with Peninsula Testing & Controls in 1962.

In July 1966 Peninsula Testing and Controls opened up a branch office in Pajaro to oversee the construction observation and testing work they were performing for Cabrillo Community College. This office was managed by **Jo K. Crosby**, PE and was the ***first business offering soil mechanics and foundation engineering services in Monterey County.***

**Gribaldo, Jacobs, Jones & Associates (1961-69); Gribaldo, Jones & Associates (1969-72)**

 Gribaldo, Jacobs & Jones (GJ&J) was founded in 1961 by **Albert C. Gribaldo**, PE (1926-2004), **Alvin A. Rathbun** (1922-2011), **Myron M. Jacobs**, PE (1924-94), **William F. Jones**, PE (1927-2006), and **Dan Rhoades**, PE (1931-2019). They were originally based in Mountain View on the San Francisco Peninsula. Some of their key employees included **Phil Burkland**, **Gery F. Anderson**, **Donald H. Dahl**, **James E. Likens**, **Bill Flick, Jo K. Crosby** (Watsonville), **Bill McMorrow, Bill Wigginton**, and **John P. Nielsen** (BSCE ’56 SJSU; MS ’58 Wyoming; PhD ’61 Colorado), who departed in 1962. They eventually established branch offices in San Francisco, Oakland, and Watsonville.

GJ&J was dissolved in 1969 because of the San Jose East Highlands Landslide, which generated too many lawsuits. A new firm was organized, called **Gribaldo, Jones & Associates** (GJA), which lasted until ~1972, when it broke up and many derivative forms were spun off, started by former partners and associates of GJ&J and GLA. Some of these are described below.

Around 1968-69 **Myron Jacobs** decided he wanted to go back to U.C. Berkeley to get his PhD, so GJ&J became **Gribaldo, Jones & Associates** (GJA). He intended to perform a study of potential BART line extensions, but eventually gave up on this work for lack of funding and moved down to Watsonville (the Berkeley geotechnical program never had a role in the planning, design, or construction of the BART project, between 1960-74).

**Insurance crisis of 1967-71**

In 1967-71soils engineers in California lost their Errors & Omissions (E&O) insurance because Lloyds of London felt that California was uninsurable for earth movement problems (this decision was in the wake of unprecedented geotechnical problems assiociated with record storms in 1967-68-69). The three big firms operating in the S.F. Bay Area at that time were Woodward-Clyde, Dames & Moore, and Gribaldo, Jacobs and Jones. D&M didn’t do many single family residence consultations, just the Redwood Shores development. Woodward-Clyde-Sherard was the biggest firm doing housing work in the 1960s. In 1967 Ned Clyde started a remedial construction firm named Remell Corporation to tackle the distressed homes that were dragging Woodward Clyde into costly litigation.

**Derivative firms of Gribaldo, Jacobs & Jones**

**T.J. Pilecki & Associates (1960-71); Soil Engineering Company (1971-2000)**

 **Tadeusz Jozef “T.J.” Pilecki**, GE (1921-2003). He was educated in Poland and immigrated to Ohio from Trinidad & Tobago in June 1953, then onto California, around 1954-55, likely working for one of the Gribaldo testing firms. In 1957 he was registered as RCE 11087. In 1960 he founded **Pilecki & Associates** as a sole proprietorship, working out of his home at 1040 Keith Avenue in Berkeley. Around 1971, he started a new firm, **Soil Engineering Company**. Every site he investigated was characterized as having three “soil layers,” based on extrapolation of blow counts recorded while driving a pipe sampler through surficial soils, colluvium, etc. He also penned numerous discussions commenting on technical articles that appeared in ASCE’s *Journal of the Soil Mechanics & Foundations Division* during the 1960s and 70s.

**Provenzano & Associates (1968-1991); SOILS (1991-2011); Joseph M. Provenzano Geotechnic**

 Founded by geotechnical engineer **Joseph M**. “**Joe” Provenzano** (1930-2011) (BSCE ’48 Polytech Univ NY; MS ’50 Columbia) around ~1968, based in Richmond. Joe did his masters in soil mechanics under Don Burmister at Columbia (MS 1950), before moving to California. Provenzano previously worked for Gribaldo, Jacobs & Jones, where he had managed their Las Vegas office in the 1960s, before returning to the Bay Area and settling in Pinole. Provenzano & Associates was based in Richmond, and moved to San Anselmo in 1988. One of his early employees was **Jim C. Reynolds**, PE (profiled below). Provenzano developed a working relationship with U.C. Berkeley and Contra Costa County in the late 1970s through the 1980s. SOILS was established as a separate division of Provenzano & Associates in 1991, based at the same Richmond address. He also served as CMT’s in-house engineer for many years. Joe was still working as **Joseph M. Provenzano Geotechnic** in Concord until he passed away on November 1, 2011.

**Break-up of the Earth Systems** **family of companies (1970-76)**

Earth Systems went through a metamorphosis between 1971 and 1976. During this period they sought to expand their operations through the establishment of branch offices, similar to what Woodward-Clyde had done in the 1960s. During the early 1970s they dispatched Bill Wigginton to evaluate the geotechnical markets in Sacramento and Fresno. They also looked at San Diego and other parts of California.

The first principal to leave was **Dick Harlan,** with all his staff, in 1975. He told the executive committee: “*you can buy me out or I am going anyway.*” Earth Systems said “*Well, we’ll keep operating under the name Harlan Engineers for so many years minus Dick Harlan and his staff*,” so they operated out of Concord without Harlan for about a year. In 1975 Dick formed **R.C. Harlan & Associates** and operated out of San Francisco thereafter (even after forming **Harlan-Miller-Tait** in 1982).

1976 witnessed the break-up of **Earth Systems.** That yearthe executive committee convened; it consisted of **Al Gribaldo, Gery Anderson**, CEG, **Carl Greenlee, Norm Hallin, Phil Burkland, Bill Wigginton**, and **Alvin Rathbun**. In Feb 1976 both Geomechanics and ENGEO opted out of their Earth Systems affiliations. **Geocon** remained down in San Diego with its principal **Jim Likens**; but they eventually broke away. Earth Systems branches started dropping off because insurance for residential work became available around 1975, and ENGEO began servicing the work out at Blackhawk, which began shortly thereafter (in 1976).

**Jo Crosby & Associates** **(1970-unknown)**

 Founded in May 1970 by **Jo Kent Crosby**, GE, CEG (BS Geophy ‘55 Utah; PhD CE ‘81 Stanford), after serving as one of the senior associates (with Myron Jacobs) of Gribaldo, Jacobs and Jones and Peninsula Testing & Controls’ Watsonville office. Crosby & Assoiciates were based in Palo Alto, near Stanford. He later did a lot of consulting for **Failure Analysis Associates** of Palo Alto from the mid-1970s to the mid-1980s, while working on his doctorate in geotechnical engineering under Prof **Wayne Clough** at Stanford. **Don Dahl** (formerly with GJ&J) and **W.** **Patrick Murphy** were geologists for Crosby in the late 1970s. Crosby also served as President of CalGeo in 1987-88.

**Reynolds & Associates (1970-79); Reynolds, Jacobs, Haro & Associates (1979-81)**

**Jim Reynolds & Associates** had always been a part of Earth Systems operating in Watsonville. There he was assisted by **Tom Makdissy** (who started Terrasearch in 1976) and **Hassen Amer** in the early 1970s. Reynolds had his PE license, but was also an ordained minister, so he gave up soils engineering and went into the ministry full-time. After his departure **Myron Jacobs** assumed much of Reynolds’ work in Monterey and Santa Cruz Counties, along with **Joe Haro**. Reynolds eventually returned to geoengineering and started a new firm, while Myron Jacobs and Joe Haro operated separate firms, including Jacobs, Haro & Associates (1981-87), described below.

**Soil Engineering Construction (1970-present)**

 Design-build geotechnical construction form founded by **Robert D. Mahoney**, PE, GE (BSCE ’62; BA Geol ’63; Notre Dame) in 1970 and based in Redwood City. Previous to the start-up Mahoney had worked for Gribaldo, Jacobs & Jones (1963-68), and as a project manager for Pacific Architects and Engineers of San Francisco, working for the military in Southeast Asia (1968-70). Some of the firm’s principals have included: **George Drew**, PE (BSCE ’65 **Connecticut**), a former Seabee officer, who joined the firm in 1980; **Brent Harris** (BS Berkeley; MA SFSU) who also joined the firm in 1980; **Ken Faught**, CEG (BS Geol ’68 Oregon State) was their grouting specialist in the 1990s, **Bryan Talmadge**, PE (BSCE SJSU); and **John Niven**, PE, who manages the firm’s southern California operations, in Encinitas.

**Earth Systems, Inc. (1971-76); Earth Systems Consultants (1976-2004)**

**Al Gribaldo** figured his firm would be sued repeatedly if they continued doing hillside residential work, but decided to form Earth Systems, Inc. around 1971. They didn’t do any technical work and Gribaldo never signed a report after Earth Systems was set up. In 1971 they retained all the old GJA employees: the San Francisco office was managed by **Bill Jones**, the San Jose office run by **Carl Greenlee**, the Oakland office by **Dan Rhoades** (mostly), assisted by **Myron M. Jacobs** (BSCE ’49 Berkeley). These regional offices served those respective areas.

 Meanwhile, Al Gribaldo started to expand their operations southward. He began by purchasing Norman Hallin’s firm **Buena Engineers, Inc**. in the Oxnard/Ventura area. But GJA lost their insurance, so came up with the concept to form **Earth Systems, Inc.** while Carl Greenlee formed **Applied Soil Mechanics Inc. Phil Berkland**, CEG was the firm’s principal engineering geologist, assisted by **Murray Levish**, CEG. **Burkland & Associates** was formed as the geological services company in 1973 (see write-up below). **Max Gahrahmat,** PE (BSCE ’69; MS ’76 SJSU) worked for CMT in the 1970s in San Ramon, then departed geotechnical field to work in commercial real estate development in Santa Clara.

 Gribaldo’s theory was to have these separate businesses, but their big limitation in performing residential work was the lack of available insurance. **ENGEO, Inc.** was originally formed with the restriction that they were not to provide consultations on single family residences (their senior partner Bill Wigginton had worked for GJ&J from 1966-71). Around 1968 **Dick Harlan** was brought in from Bechtel and he volunteered to perform geotechnical work on single family residences, and it wasn’t long before he was being sued, repeatedly. ENGEO refrained from providing recommendations for single family residences for their first three or four years, and managed to survive. Meanwhile, everyone seemed to be keeping busy with all of the development occurring across the San Francisco Bay Region.

**ENGEO Incorporated** **(1971-present)**

 The three founders of ENGEO in 1971 all previously worked for GJJ: **Bill Wigginton**, CEG (1931-2017) (BS Geol ‘53 Lafayette Coll; MS ‘56 Penn State) (44%), **Shalom Eliahu**, GE (BSCE ’49 Robert College; MS ’68 Berkeley) (22%), and **Jean C. Meuris**, GE (MS ’60; MEng ’61 Caltech) (32%). The firm’s office was originally in Berkeley, then moved to Concord, and finally, to San Ramon. In 1986 **Uri Eliahu**, GE (BSCE ’81 Berkeley) and **Paul Guerin**, GE (BSCE ’81; MS ’82 Berkeley) joined the firm, and Eliahu became CEO in 1992. Senior geologists included: **Debra Carey**,CEG, (BS ’77 UC Davis) now with Shaw, **Brian Flaherty**, CEG, CHG, **John LaViolette**, CEG(BS Geol ’71; MS ’81 CSULB), **Gary Smith**, CEG, **Miles Grant**, CEG (BS Geol ’86 USC), **Duncan Hickmont**, CEG, **Steve Connelly**, CEG (BA Geol ’80 UCSB; MS ’88 SJSU), **Phil Stuecheli**, CEG (BS Geol; MS Ohio State), **Eric Harrell**, CEG, Principal Geologist **Ray Skinner**, CEG (BA Geol ’75 Delaware), and **J.** **Brooks Ramsdell**, CEG (BS ’96 CSUH; MA ’99 USC). Branch offices opened in 1990s. ENGEO did geotechnical work for 40,000 Bay Area units between 1971-96. Other key personnel: **Jeffrey Adams**, PhD, PE joined the firm in 1999 and became an Associate in 2010. **Julia Moriarty**, GE is a principal and manages the San Jose and Irvine offices. **Shawn Munger**, PG, CHG is principal geologist in the Sacramento office. Other principals include **Theodore ‘Ted’** **Bayham**, GE, CEG (BS Geol ’84 NAU Flagstaff), **Donald Bruggers**, GE (BSCE ’76 Michigan State), **Daniel Haynosch**, GE, **James “Chip” Moore**, PE (deceased 2013), and Principal **Josef Tootle**, GE and Principal **Macy Tong**, GE joined ENGEO in 1985. **Stefanos Papadopulos**, GE became as Associate in the San Francisco office in 2013 and **Janet Kan**, GE, CEG (BS GeoE UBC; MS 2004 Berkeley) became an Associate in 2013. Dan Haynosch served as President of CalGeo in 2002-03. **Pedro Espinosa**, GE (BSCE 2004; MS 2006 Berkeley) was named a principal in San Ramon in 2020.

ENGEO became an employee stock option plan owned (ESOP) firm in 1986 and has gradually expanded, acquiring **Anderson Consulting Group** of Roseville in 2002 (now in Rocklin), which included **John A. Baker**, GE, who directed Anderson’s geoenvironmental group. ENGEO currently has seven California offices, in San Ramon, San Francisco, Oakland, San Jose, Ripon, Rocklin, Santa Clarita, and Irvine. They employ a staff of around 130. The firm is involved in major military base reuse projects such as Mare Island, Treasure Island, Fort Ord and Hunters Point, transportation projects such as California High Speed Rail and the BART extension to San Jose, and major infrastructure and flood control such as large levees, WWTP projects, dams, pipelines, etc.

The firm has expanded its core geotechnical service offering to include comprehensive environmental engineering, hydrologic engineering, and the full range of soil and materials testing and inspection services. ENGEO purchased Land Marine Geotechnics in 2006 and Bill Rudolph joined the firm as Principal Geotechnical Consultant.

In 2012 ENGEO acquired Geoscience Consulting NZ, a New Zealand environmental and geologic consultancy, having established an office there in order to assist with the response to the devastating damage from earthquakes in 2010 and 2011. They sent **Don Bruggers**, GE to be the principal managing engineer of this office. They also opened up an office as ENGEO PTY Limited in Australia. In 2019 they acquired Geotechnical Consultants offices in Orange County and San Francisco. By 2020 ENGEO maintained a staff of more than 300 professionals located throughout California, Nevada, Washington, New Zealand, and Australia.

**Applied Soil Mechanics, Inc. (1972-2004)**

 Started by **Carl W. Greenlee**, PE (1932-2012) in San Jose for many years, then in Fremont, where **Bill Zehrbach**, GE directed its operations. **Ben Patterson**, CEG was their chief geologist in the early years. Greenlee remained in Gilroy, but the firm moved to San Luis Obispo before filing for bankruptcy in 2004.

**United Soil Engineering, Inc. (1972-present)**

United Soil Engineering was founded in 1972 and based in Santa Clara. Their principal engineer was **Mahmoud** “**Max” Gahrahmat**, PE (BSCE ’69; MS ’76 SJSU), who also owned several soils testing firms (see below). Other engineers included: **S. Ali (Alex) Kassai** (RCE 34882), and before him, **Herb Volin**, PE (who later founded Diablo Soil Engineers). Their engineering geologists were **Rick Haltenhoff**, CEG (see profile below) and **Kendall “Ken” Price**, CEG. Present staff includes Vice President **P. Vien Vo**, PE, **Sean A. Deivert**, and **Ben D. Ta**.

**Soil Services (1972-82); Construction Materials & Testing (CMT) (1982-present)**

Soil Services, a materials testing firm, was spun off of Gribaldo, Jacobs & Jones when that firm broke up, around 1972. They operated from an office in San Ramon in the early 1970s, run by **Max Gahrahmat**, PE (BSCE ’69; MS ’76 SJSU), with their senior soils tech **Don Rose**.

This operation later moved to Concord and changed its name to **Construction Materials & Testing**, or CMT. Their largest competitor was **Testing Engineers** of Oakland, a similar spinoff from Woodward-Clyde, managed by **Merlyn Isaak**, PEand **F. Robert Preece**, PEin the early 1970s. **Don Rose** continued as the principal soils technician of CMT.

**Daniel J. Rhoades & Associates (1972-75); Purcell-Rhoades (1975-present); The PRA Group, Inc (1988-present)**

 Founded in 1972 by **Daniel J. Rhoades**, GE (BSE Stanford; MSCE ’56 Georgia Tech). He was a principal of GJA (see above). In 1971 he had established **Testing & Controls**, a materials testing firm based in Oakland, and later Concord. Rhoades & Associates was a sole proprietorship based in Sunnyvale until 1975. That year he joined with **Bruce G.** **Purcell**, CEG to form **Purcell-Rhoades**, based in Concord, and later in Pleasant Hill. A few years later they also established a branch office in Hayward.

 In the late 70’s and ‘80s their engineers included **Wayne Pandorf**, PE, **Bill McMorrow**, PE, **Peter E. Monk**, PE and **Simon E. Kisch**, PE (MSCE ’76 Berkeley) served as Associate Engineer. **Alan L. Stanley**, an experienced grading inspector from Contra Costa County, served as their principal soils technician in the 1970s. **Dean Affeldt**, CEG has served as the firm’s principal engineering geologist for 25+ years, assisted by other geologists, including **Mike Carey** (1978-81), **Warham A. Stejer**, CEG (1983-88), and former soils tech **Joe Ambrosino**, who later became an associate engineering geologist. The firm was wholly owned by Dan Rhoades.

 A separate firm named **The PRA Group, Inc** was established in 1988. They currently operate with offices in Pleasant Hill and Hayward. Officers are **I.** **Dean Affeldt**, CEG, President, along with partners **Daniel J. Rhoades**, GE and **Donald R. Poindexter**, GE.

**W. F. Jones, Inc.** **(1973-95)**

 When the insurance problems cropped up for Gribaldo, Jacobs & Jones, **“Bill” Jones** parted ways, forming **William F. Jones, Inc.** and focusing on doing forensic work out of Sunnyvale and San Mateo, beginning in March 1973. Bill was also known for smoking a pipe, like a professor of the “old school.” He was a native of South Shields, England. After completing his undergraduate work in civil engineering at Durham University, he worked two years in Tynemouth, England. In 1949 he received a Rotary International Fellowship to attend Caltech in Pasadena, where he pursued a master’s degree in civil engineering with an emphasis on soil mechanics under Professor Fred Converse. His thesis was on “*Vibration Compaction of Cohesive Soils,*” which he completed in 1950 (published in 1955 with Converse). For many years his principal assistant was his son **Christopher Jones**.

**James B. Baker**, CEG (BS Geol ’71; MS ’76 Stanford) served as VP and Chief Scientist from 1982-90, while **Daniel F. Dyckman**, GE served as senior engineer and office manager, from 1984-89. They were assisted by geologists **Mike Carey**, CEG (1983-86) and **Duane Pankhurst**, CEG, CHG (1986-95), among others. Between 1976-95 the firm was principally engaged in forensic work, operating out of offices in San Mateo. W. F. Jones, Inc closed its doors in March 1995, when Bill Jones retired. Jones was active in the California Society of Professional Engineers, and served as CSPE President in 1971-72, PEPP Chair, and on the NSPE Board of Directors for several years. This business continued into about ~1995, and Alan Kropp subsequently purchased their files. Bill Jones passed away on May 26, 2006.

**Burkland & Associates (1975- 85)**

Founded by **Al Gribaldo**, PE (1926-2004) (BSCE ’49 Berkeley), **Philip V. Burkland**, CEG (1937-2009), and several others. **Phil Burkland** received his bachelor’s degree in geology from Stanford in 1959, and was recognized as an accomplished editor of technical reports. Around 1971-72 he had an aneurism which resulted in his being paralyzed from chest down and he spent the remainder of his life in a wheelchair, so he wrote geology reports from the office. This firm did all of the engineering geology work for the various firms in the Earth Systems family of companies from about 1975-85. Their principal engineering geologist during that time was **Murray Levish**, CEG (BA History ’52 NYU; MS Geology ’55 Illinois), who had previously worked for GJJ and Woodward Clyde. Most of their personnel were absorbed back into **Earth Systems Consultants** around 1985.

**Terrasearch (1976 - 2010); RMA Group (2010-present)**

Founded by **Tom Makdissy**, GE (BSCE ’61; MS ’67 SJSU) in 1976 after he worked for Jim Reynolds & Associates in Mountain View (1969-76). Terrasearch was always based in San Jose, but at various times had branch offices in Dublin, Pacheco, Cordelia, and Sacramento. By 2005 they had completed 11,000 projects and had offices in San Jose, Livermore, Oakland, Sacramento and Fresno. Their first chief geologist was **Curtis Messenger**, CEG, assisted by **Ed Porter**, CEG. **Richard C. Kent**, RG (BS Geol ’71 Oregon; MS ’72 Portland State) joined as principal geologist in Oct 1990, working out of the Dublin office. **Rich Rowland**, CEG (BA Geol ’56 Kansas State; MS Geol ’66 UCLA) was the firm’s principal engineering geologist throughout the 1990s and 2000s, working out of San Jose. Tom’s nephew, **Simon Makdisy**, came from Australia to manage the firm in the 1990s, while **David W. Buckley**, PE, CEG (BA Geol ’75 UCSB; MS ’77 Purdue) and **Larry Pavlik**, CEG provided engineering geologic input.

In the 2000s the firm was run by three of Tom Makdissy’s nephews: **Simon Makdessi**, GE, **George Makdissy**, PE, and **Issam Makdissy**. **Eric Swenson**, CEG (from Kleinfelder, Ninyo & Moore, and Harza) was their senior engineering geologist from 2001-06. **Robert Campbell**, CEG (BS Geol ’89 UC Davis; MS 2006 CSU East Bay) served as their engineering geologist from 1996-2007. After Swenson moved to Consolidated Engineering Labs, **Larry Pavlik**, CEG, **John LaViolette**, CEG, and **Pat Drumm**, CEG, CHG provided consulting engineering geologic services to the firm. In 2010 Terrasearch was acquired by the **RMA Group** of Rancho Cucamonga, who have maintained their office in San Jose.

**Myron Jacobs & Associates, Inc. (1981); Jacobs, Haro & Associates (1981-87); Jacobs, Raas & Associates (1987-1993); Steven Rass & Associates (1993-2002); Bauldry Engineering (2000-2014)**

 In the late 1960s **Myron M. Jacobs** (1924-94) (BSCE ’49 Berkeley) departed the Bay Area to manage GJ&J’s Watsonville office, and he remained in that area the balance of his career; initially in partnerships with **Jim Reynolds**, then with **Joseph A. Haro**, GE (btwn 1981-87), and later, with **Steve Raas**, GE (1987-93). Steve Rass went out on his own sometime between 1991-93, then sold his business in 2002 and moved to Reno by 2004. **Brian D. Bauldry** GE GE (BFA ’76 Wayne State; MSCE ‘90 SJSU) (1946-2018) was Raas’s senior geotechnical engineer between 1991-99, before starting **Bauldry Engineering** in 2000. They were purchased by **Pacific Crest Engineering** in 2014.

**Applied Earth Consultants (1983-88); Applied Engineering Construction (1985-89); Associated Terra Consultants (1989-present)**

# Founded in 1983 by Frederick W. “Rick” Haltenhoff, CEG, CHG (BA ’65 The Citadel; MS Geol ’78 SJSU), after working for United Soils Engineering. In 1979 Haltenhoff edited the oft-cited volume “*Recent deformation along the Hayward, Calaveras, and other fault zones, eastern San Francisco Bay Region, California*” for field trips accompanying the Cordilleran Section meeting of the Geological Society of America. The company was based in San Jose. Diane A. Hughes, and Ken Mateik, CEG, CHG (BA Geol ’78 SFSU), and Bill Dugan, PG (BS Geol ’85; MS ’93 SJSU), founder of GeoRestoration and WellTest, all worked for the firm in the 1980s.

# Applied Engineering Construction was also founded by Rick Haltenhoff, CEG in March 1985, and based in San Jose. In July 1989 he formed Associated Terra Consultants (ATC), while working part-time as the Santa Clara County Geologist. ATC was originally based in Los Gatos, then moved to Campbell. He passed his CHG exam in 1995. His firm provides a wide array of services relating to engineering geology and hydrogeology, including assessments of septic tanks and leach fields, etc.

**Haro, Kasunich & Associates (1984-present)**

 Founded by **Joseph A. Haro**, GE (BSCE ’77 Fresno State) of Hollister and **John E. Kasunich**, GE (BSE ’70; MSCE ’72 UCLA) of Watsonville, in 1984, after both men had worked in the Santa Cruz, Monterey, and San Benito County areas for many years, with Jo Crosby, Myron Jacobs, Jim Reynolds, and Steve Raas, as well as Reynolds, Jacobs, Haro & Associates (1979-81) and Jacobs, Haro & Associates (1981-87), profiled above.

 The firm is based in Watsonville. **Moses Cuprill**, PE (BSCE ’99 CPSLO) is the Principal Engineer Senior engineers have included: **Christopher George**, PE (BSCE ’87 SJSU), **Vicki Odello**, PE (BS Geol ’86 CSU Sonoma; MSCE ‘88 Berkeley); **Elizabeth Mitchell**, PE from 1999-2006 (profiled below), **Greg A. Bloom**, PE (BSCE ’95 CPSLO), **Moses Cuprill**, PE (BSCE 2003, CPSLO) since mid-2005, and **Vicky Odello**, PE (BS Geol ’86 Sonoma; MSCE ’88 Berkeley), **Robert Hasseler**, GE (MSCE ’93 Berkeley) . The Senior Coastal Engineering Geologist is **Mark Foxx**, CEG (BS Geol ’75 Wash State; MS ’84 UCSC).

**Geoforensics, Inc. (1989-present)**

In 1989 **Daniel F. Dyckman**, GE (BSCE ’80; ME ’81 Cornell) founded **Geoforensics** as a geotechnical testing and consultation firm, based in Foster City. He previously worked for Haley & Aldrich (1981), Golder Associates (1981-82), and Jeffrey & Katauskas in NSW Australia (1982-83). In 1984 he came to the Bay Area to accept a position with **W.F. Jones, Inc**, where he served as the office manager until 1989. After starting Geoforensics, he continued to provide technical support for W.F. Jones and other geotechnical firms, with his principal focus on expert witness services.

**Nielsen Geotechnical, Inc. (1991-present)**

 **John P. Nielsen**, PhD, GE (BSCE ’56 SJSU; MS ’58 Wyoming; PhD ’61 Colorado) began his career in the fall of 1955 working 20 hrs per week for Testing & Controls of Mountain View, while studying civil engineering at San Jose State. After graduation in June 1956, he worked full time for them until departing for graduate school at Wyoming, in the fall of 1957. After completing his PhD at Colorado in 1961 he was hired by Gribaldo, Jacobs, Jones & Associates shortly after their start-up, and shared an office with Bill Jones, with whom he remained close for many years.

 In late 1962 he joined Soil Mechanics & Foundation Engineers, Inc.(which became Wahler & Assoiciates) at their office in southern California, supervising large scale triaxial tests (36” x 72” cylinders) for large hillside grading projects. When he returned to the Bay Area he continued working for Wahler & Associates, while teaching soil mechanics courses at San Jose State. In 1983 Al Grbaldo aksed him to supervise the technical aspects of Earth Systems Consultants while he went on an extended trip to Europe. Satisfied with his oversight, Gribaldo asked him to work full-time for Earth Systems, and he remained there for eight years, overseeing the technical aspects of their geotechnical group. In 1991 he established his own consultancy in Los Altos, and in 2007 moved to Palm Desert, where he continued his consulting.

**Landset Engineers, Inc (1998-present)**

 Landset Engineers, Inc.was formed in 1998 as a civil engineering design, land surveying, soil and geotechnical engineering, geology, construction inspection and testing, stormwater pollution prevention, and environmental consultation.full-service firm, serving Monterey, San Benito, and southern Santa Clara Counties. The firm principals include: **Guy R. Giraudo, PE, LS** (BSCE 1990 CPSU-SLO), **Brian E. Papurello, CEG (BS Geol 1986 SDSU), and Caroline D. Hodges, PE, QSD (BSCE 2001 Texas A&M). Papurello also serves as the Santa Luis Obispo County Geologist.**

**ES Geotechnologies** **(2004-present); Earth Systems Pacific, Inc (2011-present)**

 The San Francisco Bay Area office of the Earth Systems Group of Companies, replacing Earth Systems Consultants-Northern California. Formed in 2004 and based in Milpitas. President **Terrance J. Zich**, AG (agricultural engineer) and their Principal Geotechnical Engineer was **Bill E. Zehrbach**, GE (BSCE ’68 USC; MS ’70 Berkeley). Zehrbach had previously served as vice president of Earth Systems Consultants - Northern California. **Girmay Weldegiorgis**, PE (BSCE 2002 Arbaminch; MS 2011 CSU Sacramento) serves as senior engineer with Earth Systems Pacific, who maintain an office in the Bay Area.

**Pacific Crest Engineering, Inc (2006-present)**

 Firm founded as a WBE by **Elizabeth Mitchell**, GE (BSCE 1989 CPSLO; MS ’96 SJSU) in May 2006 in Salinas, and presently, by the Watsonville Airport. Mitchell previously worked for Haro, Kusinich as a senior project engineer (1999-2006). **Brian D. Bauldry**, GE (BFA ’76 Wayne State; MSCE ‘90 SJSU) joined the firm as VP of geotechnical engineering in May 2014, while **James F. Walker**, PE is Principal Chemical Engineer. **Soma Goresky**, GE (BS EnvSci ’86 UCSC; MSCE ’89 SJSU) joined the firm in Feb 2016 as an Associate Geotechnical Engineer.

**Butano Geotechnical Engineering (2011 – present)**

 Founded by **Greg A. Bloom**, GE (BSCE & BA Bus 1995 CPSLO) in 2011, after having grown up in Hollister and working for Haro, Kasunich in Watsonville. Butano Geotech was originally based in Freedom, CA and subsequently moved to Watsonville. **Philip Edwards**, FE (BSCE Davis) serves as a staff engineer, and **Jim Olson**, CEG (BS Geol 1992; MS 1998 UCSC) of Bayside Geology serves as their contract engineering geologist.

**Wahler threadline**

**Soil Mechanics & Foundation Engineers, Inc. (1961-68); W. A. Wahler & Associates (1965-79); and Wahler Associates (1979-94)**

**William A. “Bill” Wahler** (1925-88) was born in Colorado in Nov 1925 and his family moved to southern California in the late 1920s-early 30s, where his father worked for the Navy. The family lived in Chula Vista/San Diego, Catalina Island, and later in Santa Ana. Bill graduated from St Catherine’s Military Academy in Anaheim in June 1942. He enlisted in the Naval Reserve V-12 program and attended Pasadena City College, graduating in January 1944. He served as a Navy officer from 1944-46, achieving the rank of Lieutenant. From 1949-53 he attended the University of Colorado on the GI Bill, while working for the Bureau of Reclamation in Denver. He completed his BSCE degree in 1950 and MS in March 1952 at Colorado.

In 1952 he formed a partnership with Dr. **Jim Sherard** in Denver and Washington, DC,which was short-lived because they both joined Woodward-Clyde when the firm established an office in Denver to service the Bureau of Reclamation in embankment dam design (and Jim Sherrard became Woodward Clyde’s 4th partner). In 1953-54 Wahler attended Harvard and MIT taking graduate courses in soil mechanics. In mid-1954 he returned to Woodward Clyde’s Denver office. The following year (1955) he joined Bechtel’s dam engineering group in Los Angeles, where he contributed to on the designs of Mammoth Pool and Swift Creek embankment dams. He became registered as a California PE in July 1956, eventually becoming registered in 28 states.

In 1961 **Soil Mechanics & Foundation Engineers** was established with **Bill Wahler**, PE, CEG as President with a 78% share, and **John G. Pacey**, Jr. as Vice President, with a 22% share. The firm was based in Sunnyvale. Wahler handled the dam engineering work the firm performed, both within the United States and overseas; while Pacey managed all of foundation engineering and local geotechnical work in California. Pacey (BSCE ’54 Washington) had a MS in soil mechanics from MIT in 1956, under T.W. Lamb. He received his PE registration in 1965, but departed in 1968 to form Terratech with Wayne Ferree (profiled below).

**Re-organizaton:** In 1965 the firm was re-organized as **W.A. Wahler & Associates.** Key individuals of the late 1960s included: Chief Geologist **Robert O. Dobbs** (died in 1969), **Eugene A. Nelson**, CEG, **Doug Hamilton**, CEG, **Ed Danehy**, CEG, **Roger Hail**, CEG, **Rolf Mannson**, PE (from Sweeden), **Richard C. Harlan**, PE, **Peter Kaldveer**, PE, **John Lowney**, PE, **Richard L. Meehan**, PE, **James F. Riley**, PE, and **Richard L. Volpe**, PE. **Joseph N. Gabriel** supervised the field work during construction and **Earl Williams** came from the Bureau of Reclamation lab to manage Wahler’s soils.

With the departure of Wayne Ferree and John Pacey in 1968, followed by the departure of Meehan, Nelson, Hamilton, and Harding seven months later (in 1969), management the day-to-day operations were taken over by **Jack Wulff**, PE (BSCE ’50 UNR). Wulff implemented an associates program to encourage the senior staff to became junior partners of the firm, which was approved by Bill Wahler. This program had three levels: Principal Associates, Senior Associates, and Associates. The value of the firm was estimated by an external audit and the associates were floated loans to begin purchasing stock. The original principal associates were **Jack Wulff**, PE, **Chuck Perry**, PE, **Frank Kresse**, CEG, **Chuck Stewart**, PE, and **George B. Fink**, PE (1925-2009). The Senior Associates were **Tony Buangan**, CEG, **Jon Hennegan**, GE, **Dick Volpe**, GE, **Forrest Gifford**, GE, **Ken Rodda**, GE, and **Joe Kulikowski**, GE (managed the Newport Beach office). The Associates were **Dick Lubina**, PE, **Leonardo Alvarez**, CEG (BA Geol ’60 Universidad de Chile; MS ’62 Utah), **Jose Ladazzari**, GE, **Ed Danehy**, CEG, **Ernie Solomon**, CEG, and **Bob Tepel**, CEG (BS Geol ’60 CSULA). **Frank Kresse**, CEG (BA Geol ’56 Berkeley) came from CA DWR in 1969 and departed for Harding Lawson in Aug 1976, **Jean M. Bahr** (BS Geol ’76 Yale; MS ’85; PhD ’87 Stanford) went onto become a hydrogeology prof at the Univ of Wisconsin; and **Jim Berkland**, CEG (BA Geol ’58 Berkeley) came from the Bureau of Reclamation in Sacramento and departed to become Santa Clara County Geologist in 1977.

 **Wahler’s soils laboratory:** During the 1960s and ‘70s Wahler & Associates maintained one of the best soil mechanics laboratories in the United States. It was Wahler’s goal to maintain lab capabilities equal to, or better than the Bureau of Reclamation’s in Denver. These efforts pre-dated the era of automated data acquisition we enjoy today, and required considerable effort and manpower to manually recorded readings, arpoud the clock, seven days a week. All of the triaxial cells and lab cabinetry were manufactured in-house by Jack Wahler, Bill’s older brother, who was an expert machinist. They employed a triaxial-cell-bay that could handle six samples at a time for back-pressure saturation, and performed triaxial permeability and pore pressure dissipation studies. They were able to apply loads isotropically, anisotropically, and under k0loading conditions. The also employed high-pressure-rated triaxial cells that could exert confining stresses up to 750 psi, while specimen sample size could vary between 2.4, 2.875. 4.0, 6.0, and 12.0 inches in diameter, very unusual at that time, and today. They also had several Wykum-Farenc load cells, the largest of which could accurately measure vertical loads up to 50 tons of force. The Wahler Lab also performed all of the triaxial and consolidation testing for Bechtel’s earth dams group in San Francisco. It was an incredibly productive lab, and the great majority of testing was for in-house work. They possessed impressive capabilities in performing consolidation testing. They were the first soils lab to develop the capability of performing dynamic triaxial tests in the mid-1970s. By that time their lab was doing more lab work for other clients than simply for Wahler, under the direction of **Dick Volpe**, PE (BSCE ’63; MS ’64 SJSU), who maintained the title of Lab Director until he departed in 1979.

 **Firm’s growth:** During the 1970s the firm grew from 20 to more than 50 employees, working on projects in Brazil, Costa Rica, Mali, Nigeria, and the Philippines. They maintained branch offices in Newport Beach and Washington, DC. The DC office coordinated contracts with the US Bureau of Mines to assess the stability all mine tailings dams in the USA following the failure of the Buffalo Creek Coal Refuse embankment in 1972. In 1976 they hired retired Army Brigadier General **George B. Fink**, PE (BSCE ’46 USMA; MS ’53 Caltech; MS ’63 GWU), who had recently served as the Sacramento District Engineer, as commander of the Pacific Ocean (in Honolulu) and South Pacific (in San Francisco) Divisions of the Army Corps of Engineers, then as VP of Metcalf & Eddy in Palo Alto. In the late 1970s, **John J. Hengan**, GE (BSCE ’63 IIT) served as the firm’s Manager of Foundation Engineering and as President of SAFEA in 1981-82 (before moving to Earth Systems Consultants in Fremont). A few other senior engineers of this period included **Michael J. Poulson**, **Roger L. Wilson,** and **Farad S. Mawlaoui**.

**Hostile Takeover:** In April 1979 the senor partners took control of the company away from Bill Wahler and established **Wahler Associates.**  Wahler formed a new firm named **W.A. Wahler, Inc**., while **Wahler Associates** continued operating for another 15 years. George Fink assumed presidency of this new firm. **Jack G. Wulff**, PE (1929-2009), formerChief of Earth Dams Design at CA DWR, succeeded Fink as the President and CEO in 1985. **Forrest Gifford**, GE became the Chief Geotechnical Engineer, and **Ernie Solomon**, CEG (BA Geol ’59 Berkeley) the Chief Geologist. During their last decade some of their senior staff included **Jim McClure**, PhD, GE, **Lou Richardson**, CEG, and many others. Many of the firm’s principals had previously worked for CA DWR on the State Water Project (Wulff, Perry, Gifford, Solomon, Danehy, Kresse, Harding, and Tepel). **Bill Wahler** closed out his professional career working as the San Jose City Geologist beginning in 1984, before passing away on Sept 1, 1988 at age 62.

**Terratech, Inc. (1968-98); D & M Consulting Engineers (1998-2003)**

Founded by **Wayne E. Ferree**, GE(BSCE ’56 and BS GeoE ’56 Washington Univ-St Louis; MSCE ’65 Harvard) and **John G. Pacey**, GE (BSCE ’54 Washington; MS ’56 MIT) in 1968 and based in San Jose. Previous to the start-up Pacey had served as a managing partner and Ferree as chief engineer of Wahler & Associates. Previous to this Ferree had worked 10 years with Fru-Con Construction Corp in St. Louis (1956-66). Pacey served as president of Terratech in the early 1970s, before starting EMCON in 1981 (profiled below).

Other senior staff included: **Dennis E. Eccles**, PE, **Jerry Freeman**, CEG, **Michael A. Kern**, CEG, **Pete Anderson**, CEG (fmr Santa Clara County assistant geologist), **Jon Benfer, John Mattey, Joe Gabriel**, CEG, **Mark R. Peterson**, PE, CEG, **Betsy Mathieson**, CEG, **Frank Groffie**, CEG, **Bob Baker**, and **Joe Rafferty**, GE. They had three Bay Area offices for a while. **Pete Anderson**, CEG departed in 1988 to found Pacific Geotechnical Engineering in Morgan Hill. Before the firm was sold in 1998, Ferree had been practicing solo as an expert witness. Around 1992 Ferree moved to Minden, NV (just south of Carson City), and in 1998 he sold Terratech to Signet Testing Labs, a subsidiary of Dames & Moore, and the firm’s name became D&M Consulting Engineers. When URS absorbed Dames & Moore in 1999 the San Jose office was closed, while the Monetrey office continued operating for a few more years.

**Earth Science Associates (1969-90)**

Founded in 1969 by **Richard L. Meehan**, PE, **Gene Nelson**, CEG, **Doug Hamilton**, CEG, **Dick Harding**, CEG,and **John D. Fett**, CEG, RGP, with Professor **Dick Jahns** of Stanford as one of the firm’s Directors. Geotechnical engineer Dick Meehan(BSCE ‘61 MIT; MS ’66 Univ London; DIC ’66 Imperial College) served as the firm’s president. Prior to this Dick had worked for Wahler (1967-69), Tippetts, Abbett, McCarthy, and Stratton (TAMS) in New York, the Royal Irrigation Department in Thailand (1963-65), and as an officer in the Army Corps of Engineers (1961-63). ESA drew most of their key personnel from Wahler & Associates. Nelson, Hamilton, and Harding were engineering geologists, while Fett was a geophysicist from the southern California office. **Gene Nelson** received his BS in geology from Caltech (1956). **Doug Hamilton** had a master’s degree in geology from Stanford (1962) and later completed his PhD in geology at Stanford (1984). **Dick Harding** (1935-97) had a BS in geology from UC Riverside (1961). **John Fett** (1933-2009) had a BA in geology from Redlands (1954), BS in physics from Caltech (1956), and an MS in geophysics from UC Riverside (1968). He departed the firm after a short time, but served as a consultant on a number of projects. The firm was based in Palo Alto on Welch Road, adjacent to the Stanford campus. **Earth Sciences Consultants** and later, **ESA Consultants**, was ESA’s branch office in Colorado (continuing until Dec 1999) before being bought out by SEH.

 During the 1970s some of the principal staff included: **Leonardo Alvarez**, CEG (who came from Wahler Asociates in 1974 and joined EMCON in 1982), **W.** **Roger Hail**, CEG, **Karl Vonder Linden**, CEG (PhD Geol ’72 Stanford), **Robert H. Wright**, CEG (BS Geol ’68 SJSU; PhD ’82 UCSC), **Patrick O. Shires**, PE, RGP (BS Geophy ’72; MSCE ’75 Stanford), **Michael Dukes**, PE, **Julio E. Valera**, GE (BCE ‘62; MA ’64 Notre Dame; PhD ’68 Berkeley), **Michael L. Traubenik**, GE, **Barbara L. Turner**, **Douglas M. Yadon**, PE, CEG (BS GenEng ’74 Oregon State; MSCE ‘76 Stanford), **Philip A. Frame**, CEG (BS Geol ’69; MS ’74 SJSU) , **Roger D. Robert**, PE, **Jon Y. Kaneshiro**, GE, CEG (BA Geol ’80; MSCE ’81 Berkeley), **John Wakabayashi**, PG (BA ’80 Berkeley; PhD ’89 UC Davis), and **Peter Jacke** (MSCE 1994 SJSU) managed their soils laboratory. According to **Dave O’Shea**, ESA closed the doors of its Bay Area office in June1996.

**Emcon/Emcon Associates (1971-91); Emcon Associates, Inc (1991-present)**

Emcon Associates was founded in 1971 by **John G. Pacey**, Jr., GE (BSCE ’54 Washington; MS ’56 MIT) and **Peter Vardy**, CEG (BSGeoE ’55 Nevada Reno). Pacey had served as managing principal with Wahler and Terratech, while Vardy was principal geologist with Cooper-Clark. The firm was based in San Jose and moved their headquarters to San Mateo in the mid-1990s. Some of the firm’s early principals and included: **Eugene M. Herson**, **H.** **Randolph Sweet**, **Donald R. Andres**, PE, **Thorley D. Briggs**, **Richard J. Leach**, PE, **Fred W. Cope**, PE, and **Robert E. Van Heuit**, PE, and **Leonardo Alvarez**, CEG succeeded Vardy as the firm’s senior geologist in 1984. **David A. Cochrane**, CEG and **Bill Fowler**, CEG were senior geologists from 1985-93.A foreign for-profit corporation was established in 1981 for overseas work.

 In June 1991 the firm was re-organized as **Emcon Associates, Inc**. after being acquired by Waste Management, Inc. of Chicago. At that time the principals included **William C. Paris, Jr.**, PG (1943-93) as President (from Bechtel), **Peter Vardy**, CEG, **H. Lee Fortier**, PE, **Peter W. Clifford**, **Douglas A. Liddie**, IE, **Michael T. Dukes**, GE, **Donald M. Olsen**, PE, **Richard A. Peluso**, and **Hari D. Sharma**, GE (PhD GeotE ‘73 Purdue) as Chief Geotechnical Engineer. **Gene Herson**, PE, CPA (BSCE ’65; MS ’66 Berkeley) served as the firm’s CEO during the 1990s.

 Emcon’s business focus has been on solid waste management and geoenvironmental emgineering, including the design, construction, and permitting of solid waste facilities, and remedial investigations. In the early 1990s the firm established regional offices across the United States as separate entities (EMCON-West in San Jose, EMCON-South in Jacksonville, EMCON-Wehran in New York, EMCON-OWT in Baton Rouge, etc). The company currently has 950 employees in 40 offices spread across 16 states and Puerto Rico, with annual revenues of about $115 million. EMCON's professional staff includes chemical, civil, geotechnical, mechanical, electrical, and environmental engineers; marine and terrestrial biologists; oceanographers; plant ecologists; chemists; geologists; hydrogeologists; hydrologists and toxicologists.

**Riley Associates, Consulting Civil Engineers, Inc. (1971-2004)**

 Consulting firm established in 1971 by **James F. “Jim” Riley**, PE (1926-2004), a principal with W.A. Wahler & Associates. The firm was based in Saratoga and was not incorporated until November 1979. In 1976 he and George R. MacLeod of Saratoga patented a semi-conductor wafer packging system which they sold to Monsanto Corporation.

**Lowney-Kaldveer Associates (1971-75)**

Established by **John V. Lowney** and **Peter Kaldveer** in 1971. John and Pete had previously worked with one another at W.A. Wahler & Associates (profiled above). Some of their senior associates included **Don Hillebrandt** (formerly with Dames and Moore, Woodward Clyde, and Lee & Praszker) who worked out of the firm’s Oakland office, while **Martin R. Owen** was sent down to San Diego to manage a branch office established there (from 1971-76). When the firm launched in 1971 **Robert R. Prater** left Woodward Clyde to assume the Chief Engineer position, then opened a branch office in San Diego. From 1969-71 their chief engineering geologist was **Jeremy C. Wire**, CEG (BA Geol ’58 Pomona; MA ’61 UCLA), formerly with USACE WES-Vicksburg and the Santa Clara Valley Water District.

Around 1975 the firm was split up into derivative firms: Peter Kaldveer & Associates in Oakland, Don Hillebrandt & Associates in San Francisco, Robert Prater Associates in San Diego, Don Banta & Associates in Mountain View, and Mike Cleary & Associates in Los Altos, Owen Geotechnical in San Diego, and John V. Leonard Civil Engineers in San Jose.

**Kaldveer & Associates (1975-92); Harza Kaldveer (1992-2003); Fugro West (2003-10); Fugro Consultants, Inc. (2010-present)**

Founded in 1975 by **Peter Kaldveer**, GE (BSCE ’63 SJSU; MS ’64 Berkeley). In 1979 geotechnical engineers **Richard D. Short**, GE (BSCE ’66 UNR; MS ’72 Berkeley),formerly with Woodward Lundgren, and **Ron Bajuniemi**, GE (BSCE ’71; MS ’73 UC Davis; now with Fugro) became partners. Short served as President of SAFEA in 1983-84. Some of their more notable employees included: **Richard Rodgers**, GE (Lee & Praszker, Treadwell & Rollo), **Alan Kropp**, GE (Alan Kropp & Associates), **Bill Rudolph**, GE (Subsurface Consultants), **Mike MacRae**, PE (Jacobs Associates), **John North** (Kleinfelder), **Robin Bartlett** (City of San Ramon), **Patrick Stevens** (Stevens, Ferrone & Bailey), **Ken Ferrone**, PE (Stevens, Ferrone & Bailey), **Ken Sorrensen** (Kleinfelder), **John R. Sutton**, GE (The Sutton Group), while **David Hoexter**, CEG managed the environmental and geological services team (1987-91).

In 1992 Kaldveer & Associates was sold to **Harza Engineering** Co. of CA (Harza ECC), going by the name Harza Kaldveer. **Fugro West** absorbed Harza’s California operations in 2003, and was reorganized as Fugro Consultants, Inc. in 2010 (profiled separately, below). **Tom McNeilan**, PE was the first Oakland branch manager for Fugro West, around 1997. Project managers included **Christopher D. Trumbull**, GE (BSCE ’89; MS ’95 SJSU).

**John V. Lowney Associates (1975-95); Lowney Associates (1995-2007); TRC Lowney (2007)** Formed by **John V. Lowney** (BSCE ’59 Manhattan College; MS ’61 Purdue) in Palo Alto in 1969. Previous to this he worked for Moran, Proctor, Mueser & Rutledge in New York (1961-65), followed by a year with the U.S. Army Corps of Engineers in Kansas City. He then worked for a small consulting firm in Las Vegas, which had a contract at the Nevada Test Site. In 1967, Lowney joined Wahler Associates in Palo Alto and worked on the engineering aspects of several earth dams in California and Peru, as well as commercial developments. Between 1971-75 he formed Lowney-Kaldveer, a partnership with Peter Kaldveer, who covered the East Bay, while Lowney directed operations on the San Francisco Peninsula.

 In 1975 Lowney separated from Kaldveer and remained on his own till 2003, operating as John V. Lowney Associates. His stalwart senior engineer was **Glenn Romig**, GE, while engineering geologists included **David W. Buckley**, PE, CEG (1978-84), **David Hoexter,** CEG (from Woodward-Clyde) (1984-85), and **Ron Helm**, who joined the firm in 1988. **Fred Brovold**, GE was a senior engineer between 1999-2005.

 Lowney retired in June 2003 and turned the helm over to **Ron L. Helm**, CEG. **Brian Hubel** was senior engineer and **Tom McCloskey**, CEG became their principal geologist around 2005. In January 2007 TRC (Lowney Associates) joined all of TRC’s affiliate companies under the **TRC Companies, Inc**. geotechnical engineering brand (which evolved from the Travelers Weather Research Center, an affiliate of the Travelers Insurance Company, formed in 1961; which became an independent Connecticut corporation named TRC in 1969). Also called TRC Solutions during the environmental era, they have offices in Mountain View, Fairfield, Oakland, San Ramon and Fullerton. Key personnel are **Kent Screechfield** and **Brian Hubel** in their Mountain View office.

**Richard L. Meehan – Consulting Geotechnical Engineer (1984-2002)**

 For almost 20 years **Dick Meehan**, GE (BSCE ’61 MIT; MS ’66 Univ London; DIC ’66 Imperial College) maintained a geoforensic engineering consultation business on Welch Road just off the Stanford University campus, while teaching at Stanford University as an adjunct professor, between 1980-2005. His principal assistant was **Lauren Jelks** **Doyel**, GE (BS Geol ’84 Stanford; MSCE ’98 SJSU). Dick achieved considerable notoriety for his professional writing.

 In April 1971 he and **Doug Hamilton**, CEG published a memorable article about the Baldwin Hills Reservoir failure that appeared in the journal *Science*: “***Ground rupture in the Baldwin Hills: injection of fluids into the ground for oil recovery and waste disposal triggers surface faulting.****”* In the 1980s Dick penned a pair of books published by MIT Press: ***Getting Sued and Other Tales of the Engineering Life*** (1981) [required reading for ASFE members for many years]; ***The Atom and the Fault: Experts, earthquakes, and nuclear power*** (1984). In 1986 he published “***The battered exclusion:
who pays how much for California landslides*,”** published by Stanford University Press. The 1971 article and the three books are among the most cited literature in geotechnical engineering.

 Dick was also the principal plaintiff’s expert in ***Paterno et al vs the State of California*** flood case between 1986-2004, with an award to the plaintiffs of $550 million, the largest flood damage settlement in US history at that time (prior to Hurricane Katrina). He also worked on forensic consultations in Los Angeles involved with sinkholes and gas expulsion. In 2002 he retired and moved to Bangkok, Thailand.

**Donald Hillebrandt Associates (1975-present)**

Founded by **Don Hillebrandt**, GE (BSCE ‘61, MS ’64 Berkeley) in San Francisco in 1975, after having worked for Lowney-Kaldveer. The principal geologist who worked with him was **Jim Predergast** PE, CEG of JCP Engineers and Geologists in San Jose. Another senior employee was **Gary Carpenter**, GE, who went on to work with Don Banta. Around 1984 Don closed his office in San Francisco and worked out of his home on Clive Drive in the Oakland Hills, focusing on forensic work. He served as just about every geotechnical engineer’s expert witness in various litigations over the ensuing 30+ years.

**Associated Geotechnical Engineers, Inc. (1975-94)**

Firm founded as an MBE by **Billy M. Lin**, GE in 1975 and operated out of San Jose. **Paul C Denton**, CEG was a staff geologist in the late 1970s, and **John W. Leonard**, GE(BSCE ’65, MS ’67 Berkeley) was a senior geotechnical engineer, after having worked for Lowney-Kaldveer.Some of his employees included **David Yang**, GE (BSCENat’l Taiwan Univ; MS Tohoku Univ; PhD ’82 Purdue) from 1982-85, and **James McCarty**, PE (BSCE SJSU). After closing the business around 1994, Lin moved to Chico.

**Cleary Consultants, Inc.** **(1977 - present)**

Founded in 1977 by **J. Michael Cleary**, GE, CEG (BS GeoE ’66 Nevada-Reno; MSCE ’68 Berkeley) and based in Los Altos. Cleary began his professional career working with Lowney Kaldveer. The firm’s current President is **Chris Ciechanowski**, GE (BSCE ‘96; MS SJSU), and Vice President is **Grant Foster**, GE (BSCE ’95 Berkeley; MS SJSU). Former employees include **Eric A. “Rick” Swanson**, GE (BS Geol ’78 SJSU; MSCE ’80 Berkeley), **Rex Upp**, Ph.D., GE, CEG, and staff geologists **Tom DeSimone** and **Jennifer Hedvall**. In 2017 the firm moved to Campbell with **Chris McMahon**, PG (BS Geol 2009 SJSU) and **Kelly Dustin** (BS Geol 2011; MS 2015 SJSU) serve as staff engineering geologists, and **Dustin Lettenberger** as a staff engineer.

**Donald E. Banta & Associates (1978 – 2010)**

Founded by **Don Banta**, GE, a native of Sacramento, who attended graduate school at Nevada-Reno (MSCE ’70 Nevada-Reno). The business was based in Mountain View and he was assisted for many years by **Gary Carpenter**, GE. **Keith Johnson**, PE was a staff engineer in the early 1980s. The firm appears to have closed its doors around 2010.

**Alan Kropp & Associates (1979-present)**

Founded by **Alan L. Kropp,** GE (BSCE ’71 CSPU Pomona; MS ’73 Berkeley) in 1979 in Berkeley, after working for Lowney Kaldveer and Peter Kaldveer Associates. Over the years some of the principals have included **J. David Rogers**, PE, **Pete Mundy**, PE, **R.** **John Caulfield**,PE, **Mike Thomas**, PE (BSCE, MS ’84 Michigan) **Bill Langbehn**, PE, **James L. Vais**, GE (BSCE ’75; MS ‘79 Berkeley), **James R. Lott**, GE (BSCE ‘81; MS ’82 Michigan), **Lisa Splitter**, GE (BSCE ’03 CPSLO; MS ’04 Berkeley), **Marlene Jackson**, **Wayne Magnusen**, **Thomas M. Brencic**, PE (BS ERE ‘98 Humboldt), **Alma Luna**, PE, **Jose Serrano**, PE, and many others.

**Nordmo Associates, Inc. (1981-unknown)**

 Founded by **Kyrre P. Nordmo**, GE (BSCE ’55 Sweden; MS work ‘61 Washington) in 1981, after he worked for Shannon & Wilson in Seattle and for Wahler & Associates. The firm was based in San Jose, and later, out of Nordmo’ s home in Belmont. **Lew Rosenberg**, CEG (BS Geol ’84 New Mexico Tech; MS ’93 SJSU) was staff geologist between 1985-89, when he moved to Earth Systems’ branch office in Hollister.

**Upp Geotechnology** **(1983-2013); C2Earth, Inc. (2013-present)**

 Founded by **R. Rexford Upp**, PhD, GE, CEG (BS EnvEng ’66 Berkeley; BA Geol ’75, BS Env Res Eng ’75, MS ’75 Watershed Mgmt; and PhD Eng Geol ’83 Stanford). Rex’s graduate work for Gary Carver at Humboldt State included pioneering research in landslide length-to-width ratios. He started his firm in 1983, after working for Cleary Consultants from 1977-83, while completing his doctoral research at Stanford with Professor Dick Jahns. The firm was based in San Jose. Some of his associates included **Jim Falls**, CEG, **Mark F. Bauman**, CEG, **Mark W. McKee**, GE, **Steve Connelly**, CEG, **Robert Urban**, CEG, **Craig N. Reed**, GE, CEG, and others. Rex served as President of CalGeo in 2011-12.

In January 2012 Upp sold the firm to **Craig N. Reed**, PE, CEG (BSGeoE 2001 Wisconsin; MSCE 2007 SJSU) and **Chris Hundemer**, CEG, CHG (BA Geol ’96; MS ’98 UCSC; MSCE 2007 SJSU), who had worked for him previously (Hundemer had also worked for Treadwell & Rollo from 2007-13). In April 2013 Reed and Hundemer reformed a new firm they named **C2Earth, Inc**., with offices in Campbell and Aptos. **Cooper Dressler** and **Tyler Nakamura** are staff geologists with the firm.

**Freeman-Kern Associates (1982-2001)**

Founded in 1982 by **Jerry Freeman**, CEG and **Michael A. Kern**, CEG, who had both worked for Terratech. They were also based in San Jose, and moved to Saratoga, working out of Jerry’s home. After Kern moved to Reno, Freeman operated as **JF Consulting**.

**Rogers/Pacific (1984-1997)**

Founded in May 1984 by **J. David Rogers**, GE, CEG, CHG (BS Geol ’76 CSPU Pomona; MSCE ’79; PhD Geot ’82 Berkeley) in Lafayette until 1986, then in Pleasant Hill, with a branch office in Van Nuys (1990-96). Rogers had previously worked for **Alan Kropp**. Principals included: **R. John Caulfield**, GE (BSCE ’81 Berkeley; MS ’83 Stanford), who went onto become CEO of Jacobs Assoc in SFO; **Mike Scullin**, CEG (BA Geol ’58 Arizona State; MBA ‘81 Redlands), **Mitch Wolfe**, CEG, **Phil Gregory**, GE, and **Rob Olshansky**, AICP (BA Geol ’74 Caltech; MA ’75 Brown; MCP ’82; PhD ’87 Berkeley). Senior associates included: **Robert B. Rogers**, GE (BSCE ’68 CSPU Pomona; MEng ’80 Berkeley), **Fred H. P. Chin**, PE (PhD ’85 Berkeley), **William K. Langbehn**, GE, **Ray Fisher**, GE, **Greg Bellas**, PE (MSCE ’85 Berkeley), **W.** **Mark Storey**, PE (BA Geol; MSCE SJSU), **Sandy Figuers**, PE, RGP, CEG, CHG, **Patrick L. Drumm**, CEG, CHG, **Peter K. Mundy**, GE, **W. Mark Myers**, GE, **David Buscheck**, PE, **David L. Snyder**, CEG, and **Eric L. Smith**, CEG. Frequent consultants included: **William E. Mero**, RG (MA Geol ’62 Berkeley), **Roger Greensfelder**, RG (PhD ’81 Stanford), **Darwin Myers**, PhD, CEG, **J. Ross Wagner**, PG (PhD ’78 Berkeley), **Ron Crane**, RG (PhD Geol ’60 Indiana), **Glenn Borchardt** (PhD Soil Sci ’69 Oregon State), **Anna Buising**, PG (PhD Geol ’88 UCSB), and arborist **Joseph McNeil**. Several derivative firms listed below.

**Pacific Geotechnical Engineering (1988-2010); Geo-Logic Associates, Inc. (2010-present)**

 Founded by **Peter C. “Pete” Anderson**, CEG (BA Geol ’66 Colby College; MS Geol ’83 SJSU) in 1988 after working for Terratech in San Jose, from 1979-88. The firm has always been based in Morgan Hill. Other senior staff include **Soma B. Goresky**, GE (BS EnvSci ’86 UCSC; MSCE ’89 SJSU), **G. Reid Fisher**, PhD, CEG (BA Geol ’80 Carlton; PhD Geol ’87 Nevada-Reno) joined the firm in 1999, **Daniel J. Peluso**, GE from 1999-2010, **John Feltman,** and **Corinne Stewart** (BS Geol ’95 SJSU). In 2010 they became the northern California branch office of **Geo-Logic Associates, Inc**. (profiled below). Fisher has since moved to Cal Engineering in San Martin.

**Hoexter Consulting, Inc. (1992-present)**

 Founded in Sept 1992 by **David F. Hoexter**, CEG, REA (BA Geol ’73 UCSB; MS ’75 Stanford) after having worked for Shell Oil, Dames & Moore, Woodward Clyde, Hallenbeck, Lowney, Kleinfelder, and Kaldveer. His firm is based in Palo Alto.

**Fisher Geotechnical (1993-present)**

 Founded by **Raymond L. Fisher**, GE (BS Math ’75 SFSU; MSCE ’85 SJSU) of Rogers/Pacific in 1993, initially in Pacifica, before moving to Half Moon Bay. Ray had previously worked for Harding Lawson and Treadwell & Rollo. He grew up in Pacifica and completed math and civil engineering degrees from SFSU and SJSU.

**Cal Engineering & Geology** **(1993-present)**

Founded by **Philip Gregory**, GE (BSCE ’83; MS ’84 Berkeley) and **Mitchell Wolfe**, CEG (BA Geol ’76; MS ’82 SJSU) in 1993, and based in Walnut Creek. Phil had worked previously for Tensar and Rogers/Pacific, while Mitch had worked for the US Forest Service (Klamath NF), Seidelman & Associates, and Rogers/Pacific. In January 2015 Wolfe retired and they brought in **G. Reid Fisher**, CEG (BA Geol ’80 Carlton; PhD ’87 UNR) as their senior geologist. He and principal engineer **Dan Peluso**, GE (BA Geol ‘83 UCSB; MSCE ’87 SJSU) work out of the firm’s office in San Jose. Other principals include **Mark Myers**, GE (BSCE ’93 Case Western; MS ’95 UC Davis), and **Chris Hockett**, GE (BSCE 2004 CPSLO; MS 2009 SJSU), Senior associates have included **David Buscheck**, PE (BSCE ’93 Berkeley), **Eli Zane**, PE (BSCE 2005 Berkeley), **Dave Berger**, CEG (BS Geol 2004 UC Davis), and **Tim Keefer**, PE (who moved to Blackhawk & Canyon Lakes GHADs in 2015).

**The Sutton Group (1993- present);**

 **John R. Sutton**, GE received his undergraduate degree from Sydney Technical College in Australia and worked for Ove Arup & Partners. He moved to Denver in 1973 and earned his MSCE from Colorado in 1975, when he switched to geotechnical engineering and joined Woodward Clyde’s Denver office. He took a position with Stone and Webster’s Denver office in 1980, then moved to the Bay Area in early 1986 to join Berlogar Geotechnical Consultants as their Engineering Manager. Nine months later he accepted a position with IT Corporation in Martinez, where he served as Geotechnical Engineer, Project Manager, and finally, as Manager of their Geoscience Department. In 1990 he joined Kaldveer as an associate. In 1993 he formed The Sutton Group. From 2000-05 he was a partner in Diablo Engineers, Inc. After the firm dissolved in 2005 he continued as The Sutton Group in Lafayette.

**Romig Engineers (1994 - present)**

 After serving as principal engineer at Lowney Associates for 10 years, **Glenn A. Romig**, GE (BS GeoE ’80 Idaho; MSCE ‘84 Purdue) started his own firm, Romig Engineers, Inc. in 1994, originally based in Redwood City, San Mateo, and now San Carlos.

**Norfleet Consultants (1994 – present)**

 Founded in 1994 by **Sands H. Figuers**, PE, CEG, PGP, CHG (BA Geol’75; BSCE ‘79 Lafayette Col; PhD Geol ’88 UTEP). Firm based in Livermore, after Sandy worked for Gulf Oil in Houston, Chevron Overseas Petroleum in San Ramon, and Rogers/Pacific. Sandy served on the ***California State Board of Mines and Geology***, and has been an elected member of the ***Alameda County Zone VII Water Board*** for many years. He also provides consultations on ***construction vibrations***, including blasting (see ***Guidelines for Construction Vibrations*** in the July-Aug 2017 issue of *GeoStrata*).

**William K. Langbehn, GE (1997-2001); Langbehn Geotechnical Group (2001-present )**

 Founded by **Bill Langbehn,** GE (BSCE ’84; MS ’86 Berkeley) in Jan 1997 in El Sobrante, and later in El Cerrito. Bill had previously worked for Alan Kropp & Associates and Rogers/Pacific and specializes in geotechnical studies of the northern Berkeley and El Sobrante Hills, including assessment of active faults and ancient landslides. He continued the landslide mapping begun by Dave Rogers in 1983-86 and Alan Kropp in 1986-95 of the ancient landslides mantling the slopes of the Berkeley and Oakland Hills, based on aerial photo interpretation, broken curbs, severed utilities, pavement cracks, etc. The firm’s senior staff engineer is **Orion Agnew**, FE (BSEnvE 2010 UC Merced).

**Peters & Ross (1997-present)**

 Geotechnical and geoenvironmental consulting firm established in 1997 by **Peter K. Mundy**, GE (BSCE ‘80 Pittsburgh; MS ’86 Michigan) and based in Pleasant Hill. Pete had previously worked for Alan Kropp (1981-83), Warzyn’s Chicago office (1985-88), Rogers/Pacific (1988-90), and Golder Associates’ office in Alameda.

**Geolith Consultants, Inc. (1998-2001)**

Founded by Dave Rogers of Rogers/Pacific (profiled above) in January 1998. Principals were **J. David Rogers**, CEG, CHG, **Patrick L. Drumm**, CEG, CHG (BS Geol ‘85 West Virginia; MS ’99 CSULA), and **Fred H.P. Chin**, PE (PhD ’85 Berkeley). The firm was based in Pleasant Hill, until Rogers moved to Missouri in August 2001, and the firm closed. Senior staff included office manager **Gene Williams** (BS ’60 New Hampshire), **J. Brooks Ramsdell**, CEG (BS ’96 CSUH; MA ’99 USC) and **Kaini Butte**, PE (BSCE ’96 Berkeley). Consultants included **Leo A. Devito**, CEG, **Roger Greensfelder**, PhD, RG, **Glenn Borchardt**, PhD, and **Ron Crane**, PhD, RG.

**Redwood Geotechnical Engineering (1998-present)**

 Founded by geotechnical engineer **N. Joseph** “**Joe” Rafferty**, GE (BSCE ’73 CSU Chico; MS SJSU) in Morgan Hill, after Terratech broke up in 1998.

**Stevens, Ferrone & Bailey (2000-present)**

 Geotechnical, engineering geology, and construction testing firm founded in 2000 by **Patrick D. Stevens**, GE (MSCE SJSU) (1951-2013), **Kenneth C. Ferrone**, GE, CEG (BS Geol 1985 Dickinson; MSGeoE 1990 UN Reno), and **Jonathan Bailey**, GE (BSCE 1988; MS 1990 Berkeley) and based in Concord. All three partners had previously worked for Harza Kaldveer in Oakland. After Stevens’ death in March 2013, Ferrone became president and Bailey the vice president.

**EarthFocus Geological Services (2002-present)**

 Founded by **Patrick L. Drumm**, CEG, CHG (BA Geol ’79 West Virginia, MS ’99 CSULA) in 2002 and based in Fremont. Previous experience with RSA, Inc and Leighton & Associates in southern California with Mike Scullin, Rogers/Pacific (1994-97), Geolith (1998-2001), and Gilpin & Associates (2001-02).

**Slope Reinforcement Technology (2004-12)**

After the absorption of Kaldveer & Associates by Harza in 1992 (described above), Kaldveer VP **Richard D. Short**, GE (BSCE ’66 UNR; MS ’72 Berkeley) managed the Oakland office of Klienfelder Associates. Through Klienfelder he was then named General Manager of the Blackhawk Geologic Hazard Abatement District (GHAD), where in 2003 he developed “plate piles” to mitigate shallow slope failures that occurred in Dec 2002. In 2004, he started **Slope Reinforcement Technology**, based in Danville, which designed and oversaw installation of plate piles for public and private clients. In August 2012 they were purchased by **Geopier Foundations**, a subsidiary of **Tensar**.

**Geo-Logic Associates (2007-present)**

 Founded in March 1991 by **Gary L. Lass**, CEG, CHG (BS Geol ’74 UCLA; MS ’78 CSULA) and based in Claremont. He originally used **Bryan A. Stirrat**, PE (BSCE ’68 MSM-Rolla; MS Pet Eng ’72 and EnvEng ’74 USC) of Bryan A. Stirrat & Associates (BAS) in Diamond Bar as his engineer, until about 1999. Prior to the start-up Gary Lass had worked for Moore & Taber (1977-90), serving as President and Principal Geologist. The firm specializes in geoenvironmental engineering, with particular emphasis on landfills. Around 2005-07 they opened up branch offices in Grass Valley and Morgan Hill. **Robbie M. Warner**, GE (BA ’86 UCSC; BSCE ’87 and MS Berkeley, formerly with Caltrans and Rizzo & Assoc) in Morgan Hill; **Ken Criley**, Laboratory Manager in Grass Valley; **Chalerm (Beeson) Liang**, PE, GE (Pacific Geotechnical Engineering), Principal Geotechnical Engineer in Morgan Hill; **Jake Russell**, PE - Manager, Engineering Services Manager in Grass Valley; **Monte Christie**, PE, GE (BSCE ’92; MS ’97 Berkeley) is their Mining Services Manager in Nevada City; **Scott Purdy**, CEG, PG is the Principal Geologist in Grass Valley. In 2010 they acquired **Pacific Geotechnical Engineering** of Morgan Hill (profiled above).

**Cornerstone Earth Group (2007- present)**

 Firm founded in 2007 by several principals from Lowney Associates, with offices in Sunnyvale and Walnut Creek. Their geotechnical principals include: **C. Barry Butler**, GE (BSCE ’85 CPSLO;MS ’93 Berkeley), **John R. Dye**, GE, **Scott E. Fitinghoff**, GE, **Laura C. Knutson**, GE, **Danh T. Tran**, PE, and their senior engineering geologist was **Philip A. Frame**, CEG (1946-2010), with **Sarah Kalika**, PG joining in 2011. **Andre Ashour**, PE (MSCE 2012 Cal Poly Pomona) is a project manager. Environmental principals include: **Ron L. Helm**, CEG, REA, **Peter M. Langtry**, CHG, CEG, and **Kurt M. Soenen**, PE.

**A3GEO, Inc. (2010 – present)**

 Founded by **Wayne D. Magnusen**, GE (BSCE ’83; MS ‘88 Berkeley) in October 2010, after having worked for Alan Kropp & Associates (2005-10), Fugro-Subsurface Consultants (1998-2005), and Harding Lawson (1983-92). The other partner is **Dona Mann**, GE, (BSCE ‘95 Virginia Tech; MS ’98 Berkeley). Mann also worked for Alan Kropp between 2005-10. Magnusen serves as the President and Mann as the Vice President of the Berkeley-based firm.

**Bear Engineering Group, Inc. (2010-present)**

 Geotechnical firm founded by **Mark Schroeder**, PE (BSCE 1996 SJSU) founded in 2010 in Antioch. Schroeder had previously worked for Romig & Associates, Purcell Rhoades, and the Buller Group, dating back to 1990.

**Geotechnical firms in the Sacramento area**

The earliest geotechnical firm operating in the Sacramento area was **O. J. Porter & Co**., established in 1942, and headquartered in Sacramento (described in the Caltrans thread). In March 1953 **C. Lee Lowry** joined Porter’s firm, working out of their Bay Area and Sacramento offices until April 1960, when he formed a partnership with **Bruce McCreary** and **Leland Roberts** (described below, under Lowry & Associates). In the 1960s Porter’s Sacramento office operated under the name **Porter, O'Brien, Consulting Engineers**, until February 1966. That year the name of the Sacramento operation was changed to **Porter, Armstrong, Ripa & Associates**, the same as that of the Newark, NJ office. Pappy Porter's son, **James Porter** (1928-1987), was the Vice President of his father's companies at that time, and managing the Sacramento office. On December 18, 1967 Pappy Porter died at age 66 in Madison, New Jersey. A few months later **Jim Kleinfelder** made his first acquisition of another firm, purchasing the assets of Porter, Armstrong & Ripa’s office in Sacramento, which became Kleinfelder’s Sacramento office, managed by **Michael E. Mahoney**, PE (described in the Kleinfelder threadline).

**Moore & Taber, Engineers and Geologists (1956-74); Moore & Taber Geotechnical Engineers & Geologists (1974-90); Taber Consultants (1983-2016)**

Firm founded by **Return F. “Ret” Moore**, PE, CEG (1923-2015) and **Harmon Ray Taber**, PE, CEG (1927-2011). Moore was born in Los Angerles in 1923, but grew up in Long Beach. He was valedictorian of David Starr Jordan High School in 1941, and attended Long Beach City College, graduating in June 1943. In July he enrolled at Caltech in the Navy’s V-12 program, majoring in civil engineering. In the late summer of 1944 he was commissioned in the Navy Seabees and assigned to the 17th Naval Construction Battalion, which sailed from Port Hueneme in September 1944, arriving on Saipan, where they built airfields. From there, he moved to Okinawa in late June 1945. He was discharged from the Navy in June 1946 and enrolled at Caltech, where he completed his BSCE in civil engineering in June 1947, and spent another year and a half working on BS and MS degrees in geology (but never completing the required thesis). ***In December 1948 he accepted the first “engineering geologist” position with the Foundation Investigation Section of the State Division of Highways Bridge Department in Sacramento***.

**Harmon Ray Taber**, PE, CEG (1927-2011) (BS Geol ’48 Stanford) was from a pioneer family that ranched the Capay Valley near Esparto. He attended Stanford for about a year on the Navy V-12 program during the Second World War, then deployed to the Pacific as an enlisted electronics tech. In mid-1946 he returned to Stanford and finished his BS in geology in 1948. In 1949-50 he returned to undertake graduate work in civil engineering so he could secure an engineering position with the Division of Highways in Sacramento. In June 1950 he began working in the bridge department. From 1950-55 Moore and Taber developed written procedures to guide bridge engineering studies, which included a thorough engineering geologic examination of all sites, including borings on both upstream and downstream ends of any supporting bent.

In 1955 **Ret Moore** left the Division of Highways and founded his own firm, named **Geo-Engineering.** About seven months later he persuaded **Ray Taber** to join him as a principal. In 1956 they formed **Moore & Taber**, with Moore as president, and shortly thereafter, Ret Moore opened their office in southern California, while Ray Taber operated the office in Sacramento. Ray was a charter member of the California Association of Engineering Geologists in 1957 and served as AEG President in 1963-64, when the association went national.

 The firm’s southern California office was located in Fullerton, and later, in Anaheim, with branch offices in Bakersfield, Sacramento, and San Diego. Ray Taber lived in Davis and worked out of the northern California office in West Sacramento. During the late 1960s Moore & Taber also opened a branch office in Santa Rosa. The senior engineering geologist at that office was **William N. Schlax**, assisted by **Charles L. “Van” Van Alstine,** GE, CEG (BS Geol ’65 Montana Mines; MSGeoE ’67 Berkeley) and **Paul C. Weidig**, CEG (1967-74). The Santa Rosa office was shut down during the recession of the early 1970s.

In 1974 the company split into two separate firms, **Moore & Taber Northern California** and **Southern California**. In 1983 the northern California entity was renamed **Taber Consultants**, and remained in West Sacramento. Ray Taber continued working until 1990, when he retired (he passed away in 2011). **Frank Taber**, GE (BSE 1979 UCD; Geol courses ’81 CSUS) served as the firm’s president from June 1979 until 2016. **Andy Taber** (MBA ’77 UCR) served as the firm’s Chairman, while Exec VP **Martin W. McIlroy**, PE, CEG (BS Geol 1994 UC Davis) managed the firm’s West Sacramento office until Feb 2016, when he joined Shannon & Wilson. Other senior staff included VP **Dave Kitzmann**, PE, CEG (BS Geol 2002 Old Dominion), senior engineering geologist **Eric Nichols**, PE, CEG (BSGE 1990 UNR), and **Tom Ballard**, CHG (BA Geol ’78 Montana; MBA ’88 Denver), who served as the firm’s principal hydrogeologist. Other senior staff included: **Ron Loutzenhiser**, GE, **Glen Wade**, PG, and **Eric Hilmer**, CEG. The firm was purchased by Crawford & Associates in the spring of 2016, and Rick Sowers and Frank Taber now work for Crawford.

**Lowry & Associates (1960-95)**

 **C. Lee Lowry, Jr.**, GE (1926-2009) was born and raised in the Fresno area and served in the Navy during the Second World War. After the war, he attended Fresno State College (1947-48) and U.C. Berkeley, where he received his BSCE degree in January 1951. He took a position with the State’s San Francisco Bay Toll Crossings of the Department of Public Works, working on the design of the Richmond-San Rafael Bridge, between 1951-53. In March 1953 he took a position with **O.J. Porter & Co**., and became RCE 9104 in July 1954. He remained with Porter until 1960.

 In April 1960 he formed **Lowry & Associates** in partnership with **Bruce McCreary** and **Leland Roberts,** based in Sacramento (at the same time McCreary-Koretsky Engineers was formed, described in the Caltrans threadline). The firm provided consultations in soils engineering, pavement design, and materials testing for the Sacramento-San Joaquin Delta area. In March 1962 he purchased Roberts’ interest and the firm was restructured from a partnership to a corporation, with Lowry and McCreary as the principal stockholders. That same year McCreary introduced Lee to Joan Taylor, whom he married in September 1962, and they moved to Roseville. Between 1968-72 **Leonard O. Long**, PE managed a branch office of Lowry & Associates in Alameda. Lowry served as ASFE President in 1975-76. Sometime in the late 1980s he moved the firm’s office closer to his home, in Roseville. Two of his principal engineers included **Tom Wallace**, GE, who served as President of SAFEA in 1977-78, and founded Wallace-Kuhl Consultants in 1984 (profiled below), and from 1974-87, **Paul C. Weidig**, GE, CEG (BS Geol ’66 Case Western). The firm ceased doing business in early 1995.

**Geomechanics (1975-84); Anderson Geotechnical Consultants (1984-94); Anderson Consulting Group (1994-2002); ENGEO (2002-present)**

 **Gery Frank Anderson**, GE, CEG (BS Geol ‘64; MS Geol ’69 SJSU) began his career at Earth Systems Consultants (see Gribaldo et al threadline). Around 1975 he moved to Sacramento to form Geomechanics, Inc. Gery was formally trained as a geologist at San Jose State, and received his CEG registration in 1969. While working on his master’s at SJSU he took soil mechanics courses and gained sufficient work experience to qualify for the PE exam, which he passed in 1974, and grandfathered as a GE in 1987.

 Lee Lowry (ASFE President in 1975-76) of Lowry & Associates and Tom Wallace (President of SAFEA in 1977-78) of Wallace-Kuhl filed several grievances against him. Being cross-registered, Gery was served as President of ASFE in 1986-87, ***the first engineering geologist to lead that national trade organization.*** Geomechanics eventually became ***Anderson Consulting Group***, based out of Roseville, as an ESOP firm. **Edward J. Uhlir**, GE, CEG (BSCE ’78 Davis; MS CSU Sacramento) was the firm’s staff engineer and geologist in the 1980s, before moving to Wallace/Kuhl. **John A. Baker**, GE (BSCE ’68, MS ’73 Berkeley) directed Anderson’s geoenvironmental group for many years. They were purchased by ENGEO in 2002, when Gery Anderson retired.

**Raney Geotechnical, Inc. (1979 – present)**

Firm founded in 1979 by **John M. Raney**, GE (BSCE ‘72 UOP Stockton; MS ’73 Berkeley) in Sacramento, after working at Lee & Praesker in San Francisco, from 1973-79. The firm later moved to West Sacramento. In July 2000 the company was reorganized as **Raney Geotechnical, Inc.** Principal employees include: **William Boli**, GE, **Peter Gathungu**, GE, **Jeff Showalter**, **Joe Brusca**, and **Chris French**.

**Wallace, Van Alstine & Kuhl (1984-88); Wallace-Kuhl & Associates (1989-present)**

 Founded by **Thomas S. “Tom” Wallace**, GE (BSCE ‘58; MS ’62 Georgia Tech), **Charles L. “Van” Van Alstine**,GE, CEG (BS Geol ’65 Montana Mines; MSGeoE ’66 Berkeley) (1930-2018), and **Douglas J. Kuhl**, GE (BSCE ’68 UC Davis) in 1984 and based in Sacramento. Wallace had previously worked for the State Division of Highways (1958-62) and Lowry & Associates (after 1964); Van Alstine had previously worked for Moore & Taber; and Kuhl for Caltrans and Lowry & Associates. Wallace had served as President of SAFEA in 1977-78 and played a key role in passage of the Geotechnical Engineers title act in 1986. **Anthony M. Saracino**, CEG, CHG (BS Geology ’82 CSU Fresno; MS ‘84 Colo State) served as a senior hydrogeologist in the 1980s and 1990s, before becoming Director of Water Policy for The Nature Conservancy in 2000. From 1990-2003 **Eric Hubbard**, CEG, CHG (BS Geol ’83 CSU Fresno) was their senior engineering geologist. **Tom DeSimone**,CEG (BS Geol 2008 SJSU) joined the firm as senior engineering geologist in 2017.

 Current partners are **David R. Gius, Jr.**, GE, CEG (BS Geol ’84; MS ’89 SJSU), who serves as the firm’s president, and **Andrew S. Wallace** (BS marketing ‘87 CSU Chico) as the CFO/COO. Other principals include: **Stephen L. French**, GE as Director of Geotechnical Engineering, Project Engineers **Matthew S. Moyneur**, GE and **Dominic Potestio**, PE, **Dennis Nakamoto**, CEG, CHG senior hydrogeologist, **Edward J. Uhlir**, GE, CEG is Earthwork Services Director, while **David A. Redford**, GE and **David Hunn**, GE, and **Michael Watari**, GE are senior engineers. Gius served as President of CalGeo in 1999-2000.

**Youngdahl & Associates (1984-99); Youngdahl Consulting Group, Inc. (1999-present)**

 Geotechnical and geoenvironmental consulting firm founded by **Dennis E. Youngdahl**, GE (1942-) in Sept 1984 as a certified small business enterprise (SBE). They are based in El Dorado Hills, east of Sacramento. The senior Youngdahl served as a NOAA officer in the 1960s, prior to entering the geotechnical field. In December 1999 they incorporated as Youngdahl Consulting Group, Inc. Since 1986 their Associate Engineering Geologist has been **Roy Kroll**, CEG (BS Geol ’79 CSULB), after working for Zeiser-Kling in southern California. **John Youghdahl**, PE (BSCE 1996 CP SLO) directs their geotechnical group, assisted by Senior Geotechnical Engineer **Matthew Gross**, GE (MSCE UC Davis). **David C. Sederquist**, CEG, CHG (BA Geol ’80 CSU Sacramento) is their senior engineering and hydrogeologist, joining the firm in 1995. **Brandon K. Shimizu**, GE serves as the firm’s senior engineer, and **Martha A. McDonald**, PE as an associate engineer. **David Rader**, PG is a project geologist. The firm provides a range of construction inspection, materials testing, and analytical services through **Youngdahl Labs**. They once maintained a branch office in Roseville and field offices in Loomis and at Folsom Lake, and presently maintain a branch office in Rocklin with a total of approximately 40 employees.

**Geocon Consultants (1984-present)**

 Geocon West is a full-service geotechnical firm founded in San Diego in 1971, which was part of the Earth Systems group of companies (described previously). In 1971 **Jim Likins**, GE (BSCE ’64 Berkeley) purchased controlling interest in the firm and served as its CEO until 1999. The firm gradually expanded to include offices in Sacramento (1984), Temecula, Palm Desert, and Burbank. **John Juhrend**, PE, CEG serves as the senior principal of the Sacramento office. Their Senior Geologist is **Jim Brake**, PG (BS Geol ’83 CSU Chico; MS ’87 SDSU), and Associate Senior Engineer is **Jeremy Zorne**, GE (BSCE 1997; MS 2003 CSU Sacramento). From 2001-13 the senior geologist in the Sacramento regional office (in Rancho Cordova) was **David Bieber**, CEG, CHG, PGP (MS Geol ’84 Colorado).

**Espana Geotechnical Consulting (1989-2005); Fugro West (2006-10); Fugro Consultants, Inc (2010-present)**

 Firm founded by **Carlos Espana**, GE (BSCE ’68; MS ‘69 Berkeley; MBA Harvard) of Fugro in Long Beach in 1989, and based in Roseville. The firm was purchased by Fugro West in December 2005, with Espana continuing to manage the Sacramento Valley office’s operations. The parent organization in the USA was reorganized as Fugro Consultants, Inc in 2010.

**MGE Engineering (1990-present)**

 MGE Engineering, Inc. (MGE) was founded in 1990 in Sacramento as Federal small business and a California State DBE. The firm’s principals include **Fred Huang**, PE, **Bob Sennett**, PE, **Kang Chen**, PE, **Darrel Huckabay**, PE, and **Steve Hawkins**, PE. They provide civil, structural, and geotechnical engineering and construction management services for the planning, design, construction, maintenance, and rehabilitation of transportation infrastructure, flood control and water resource infrastructure, and other civil works. MGE is headquartered in Sacramento, California, with branch offices located in Oakland and Los Angeles. **Martin McIlroy**, PE, CEG (BS Geol 1994 UC Davis), who spent 17 years with Taber Consultants, joined the firm as a senior Project Manager and Business Development specialist in 2018.

**Holdridge & Kull Consulting Engineers and Geologists (1993-present)**

 Geotechnical firm founded in 1993 by **Tom Holdridge**, PE, CEG (BS Geol ’84 Colorado; MS EngGeol ’84 Purdue) and **Chuck Kull**, GE, CEG (BS Geol ‘84; MSCE ’87 SJSU), and based in Nevada City, as a certified small business enterprise. They also maintain branch offices in Truckee, Yuba City, Chico, and Fresno. Other partners include principal engineer **Jake Hudson**, PE, CEG (BS Geol ’89 UNR; BSCE 1991 CSUSac), and senior geotechnical engineers **Dan Keller**, GE (BSCE 2003; MS 2004 Berkeley), **Robert Fingerson**, GE (BSCE 1996 CPSU SLO), and **Jason Muir**, GE (MSCE Berkeley). Other principals include **Don Olsen**, PE, CEG, CHG (BS Geol 1982 SDSU; MSCE SJSU), **Shane Cummings**, CEG, CHG (BS Geol 1997 CSU Chico), **Pam Raynak,** and **Heidi Cummings**. In Nov 2017 **Steven Devin**, GE (BSFE ’86; MSCE ‘88 Univ Maine) joined the firm as a senior geotech engineer.

**Mark R. Petersen, GE, CEG (1995-present)**

 Since October 1995 **Mark R. Petersen, GE, CEG (BA Geol ’73 Berkeley; BSCE ’79 and MSCE ’81 SJSU) has operated as a consulting** Geotechnical Engineer and Engineering Geologist in [Twain Harte, California](https://www.linkedin.com/search?search=&sortCriteria=R&keepFacets=true&facet_G=us%3A82&trk=prof-0-ovw-location" \o "Find other members in Twain Harte, California). He previously worked for Terratech, Geotechnical Consultants, and FEMA.

**SAGE Engineers (1997 – 2019); Gannett Fleming (2019-present)**

SAGE Engineers was founded in 1997 by **Steven H. Sanders**, GE (BS GeoE and BSCE ’85 CSM; MS ’89 Berkeley) in the Sacramento area (Granite Bay), after having worked for Dames & Moore and Geomatrix in San Francisco. They specialize in water resources related aspects of geological, geotechnical, and structural engineering. **Tom Sell**, PE is Associate Engineer and Operations Manager (BSCE 1997 CSU Sacramento; MS Eng Mgt Drexel), while **Drew Kennedy**, CEG (BS Geol ’90 UCSC; MS 2002 SFSU) joined the firm in 2003 as their Geosciences Group Manager. **Darren Mack**, GE (BSCE ‘96 UC Davis; MS ’97 Berkeley) joined the firm in 2005 as their Engineering Group Manager in Roseville, and **Don Kurosaka**, SE (BSCE UC Davis; MS CSU Sacramento) is senior associate engineer. Other associates include **Bill Millhone**, PE, **Ricardo Bedoy**, PE, and **Jerry Pascoe**, GE. Since Nov 2014, **John A. Egan**, GE (BSCE ’75; MS ’77 Cornell) has managed the firm’s branch office in Oakland, and **Robert Urban**, CEG (BS Geol ’96 UCSB;MS 2004 SJSU) came from URS to set up a San Luis Obispo office from 2018-19. In March 2019 SAGE Engineers became a business group of Gannett Fleming of Camp Hill, PA, in their first acquisition of a California based geotechnical firm. **Bill Cole**, CEG, CHG of Geolinsite began working with the firm iun April 2019.

**Blackburn Consulting, Inc (1998-present)**

 Geotechnical consulting firm founded by Thomas W. and Grace Blackburn in 1998, and based in Auburn. Previous to this **Tom Blackburn**, GE (BSCE, ’82; MS ’84 Missouri-Rolla) had worked for Anderson Consulting Group. In 2003 several senior partners joined the firm, including **Tom Lokteff**, GE (BSCE 1991, MS 2000 CSU Sacramento) manages the West Sacramento, Modesto, and Fresno branch offices, Severel other partners joined the firm in 2003, **Jeff Patton**, PE (BSGeoE Nevada-Reno) in Auburn, and **Patrick Fischer**, PE, CEG (BS Geol CSU-Northridge) serves as their principal engineering geologist.

**GEI Consultants, Inc**

 GEI Consultants established an office in Rancho Cordova in the early 2000s. **David Gutierrez**, GE departed his position as Chief of CA DWR to serve as senior water resources and geotechnical engineer at this office.

**Crawford & Associates, Inc. (2012-present)**

 Firm founded by Benjamin and Sarah Crawford in August 2012, and based in Sacramento. **Ben Crawford,** GE (BSCE 2002 CPSU-SLO) previously worked for Blackburn Consulting and Anderson Consulting Group. One of their senior project managers is **Eric Nichols**, PE, CEG(BSGeoE 1990 Nevada-Reno). They purchased Taber & Consultants in March 2016.

**Slate Geotechnical Consultants (2018-present)**

 Founded in Oakland in 2018 by a number of senior associates with SAGE Engineers prior to their absorption by Gannett Fleming in 2017. These include: Principal Engineering Seismologist **Jennie Watson-Lamprey** (BA Geophy 2002 Columbia; MSCE 2004; PhD 2007 Berkeley); geotechnical engineer **Debra Murphy**, PE (BSCE Layayette Coll; MS Berkeley), Principal Geologist **Courtney Johnson**, PG (BS Geol 2004 Pacific Lutheran; MS Geosciences 2006 Penn State), Principal Geotechnical Engineer **Marc Ryan**, GE (BSCE 1995 Purdue; MS 1997 Berkeley); and geotechnical engineer **Justin Phalen**, GE (BSCE 2001 CPSU-SLO; MS 2003 UC Davis). Staff includes **Micaela Saqui, Hannah Curran, Darcie Maffioli, Nathan Wagner, Barry Zheng**, and **Sydney Maguire**. The firm focuses on seismic hazard and ground motion development, geotechnical engineering, and evaluation of geolpogic hazards.

**Corporate firms with geotechnical expertise - based in SF Bay Area**

**Bechtel Corporation (1898 – present)**

Bechtel was founded by W.A. Bechtel in 1898, when he was just 26 years old. His younger brother Arthur assisted him in the management of the firm until 1944. The firm originally specialized in railroad construction in the western United States. Bechtel’s three sons Warren, Stephen, and Kenneth joined the family business between 1919-24. The firm has been based in San Francisco since the late 1920s. In 1925 the firm began building dams (for PG&E, and later, SCE), and added pipeline construction in the 1930s. From 1931-35 they joined with Henry J. Kaiser to have the largest share of Six Companies, Inc., the joint venture that built Hoover Dam. In 1933-36 the firm joined with Kaiser again to help construct the San Francisco Oakland Bay Bridge. In 1937 they began constructing chemical plants. Some of the famous people who started their careers with Bechtel include John A. McCone, Ralph M. Parsons, and George Schultz.

In 1940 Bechtel became one of the first design-build firms, capable of designing as well as building the largest engineered structures in the world. In 1941 they branched into mining, then shipbuilding, as well as shipyard and harbor construction, as part of the war effort. Shortly after the Second World War they set up their own in-house geotechnical engineering and engineering geology groups, which they drew upon in the 1950s, when they were designing and constructing a lot of dams and power plants. The first engineering geologists they hired and a case-by-case basis. In the early ‘50s these included: **Ben Warner, Stanley M. Barnes, Victor L. Wright, Robert J. Farino**, and **Charles P. Benziger**. During this time Bechtel used **Roger F. Rhoades,** CEG (1905-72), former Chief Geologist of the TVA (1930s-mid 40s) and of the US Bureau of Reclamation (late 1940s thru mid ‘50s), as their Chief Consulting Geologist on projects all over the world, throughout the late 1950s and 1960s (he had moved to San Francisco after retiring from federal service).

In 1960 Bechtel established an in-house engineering geology group with full-time employees, headed up by **Charles “Chuck” S. Content,** CEG (BS Geol ’34 Colorado), who had previously worked for the Bureau of Reclamation in Denver. When Content joined Bechtel in 1956 there were only four geologists. By the time he retired as Chief Geologist in 1974, Bechtel employed more than 100 geologists! During his tenure the group worked on a number of geologically challenging projects, beginning with Homestake Dam. This 1960s group included; **James Jensen** (moved to Guy F. Atkinson in Jan ’63), **Lynn A. Brown**, ScD, CEG (went to the Bureau of Reclamation in Denver), **Robert A.** “**Bob” Schnaible**, CEG**, Larry West,** CEG, **Bert Hebbron**, CEG, **Don Rose,** PE, CEG (BA Geol ’60 UCLA; MSCE ’68 Berkeley). Rose went onto Leedshill-DeLeuw and then VP of Tudor Engineers. Between 1964-73 **David G. Campbell,** CEG, **Robert C. Fox**, **Judson P. Elston,** CEG, **Billie G. Hicks**, CEG, **Merrill W. Forrest,** CEG, **Howard A. “Buzz” Spellman,** CEG (onto Converse Consultants in ‘65). **Chuck Trantham**, CEG (BA Geol ’58 Colo State; MS work Oregon) worked for Bechtel. Trantham and Chuck Content mapped the geology exposed in BART‘s Berkeley Hill Twin Tunnels in 1964-67 (the first tunnels designed for tectonic offset by creep).

In the 1970s **Chuck Wyatt**, CEG, CHG and **Julian C. Isham**, CEG, CHG (BS Geol ’72 Wisc-Oshkosh; MS ’73 Michigan State) joined the group, with Isham remaining until 1987. **Carol Tosaya** (BS Geol ’75 UCLA; PhD Gphy ’82 Stanford) directed Bechtel’s materials lab from 1985-89. The Bechtel geology group played an instrumental role in the rapid growth of AEG during the 1960s, hosting meetings and sponsoring numerous presentations. As Bechtel shifted their emphasis increasingly to nuclear power plants, the requirements for engineering geology input increased markedly, and the engineering geology group numbered 60 professionals in the early 1970s.

**Cole McClure**, CEG (BA Geol ‘50 Berkeley) succeeded Content as Bechtel’s Chief Geologist in 1973 (he had previously worked for CA DWR in the 1950s). In 1977 **Arthur B. Arnold**, CEG joined Bechtel after retiring from the CA Department of Water Resources and was named Chief Geologist of Bechtel Civil & Minerals when McClure retired, in the mid-1980s. In the late 1980s their senior engineering geologist was **William H. Godwin**, CEG (who moved to MACTEC, and then to Fugro, before becoming the AEG national president in 2020).

The Bechtel Civil-Dams Department employed a number of soils engineers, who went on to form the core of the firm’s Geotechnical Engineering Group working out of the corporate headquarters in San Francisco. This group was brought together in the late 1950s, drawing on the project engineers who had supervised construction of the firm’s earth embankment dams during the 1950s. These included **Gregory B. McCaughan** in the early 1950s, who designed Bechtel’s earth dams. McCaughan was succeeded by **Harris Burke**, PE, who managed Bechtel’s soil mechanics group for 20 years, from 1957-77 (he died in 1982 or ‘83), assisted by **Joe Anderson**, PE, **Hank Hunterman**, PE, **Harry Sutcliffe**, PE,and many others. Burke came to Bechtel in 1956 to be the assistant resident engineer for the Swift Creek Dam and power canal project on the Lewis River in Washington, after serving as Head of the Field Test Section for the Garrison Dam of the Army Corps of Engineers, on the Missouri River. **Harry J. Sutcliffe**, GE (BSCE ’50 Univ Manchester; MS ’51 Caltech) joined the firm in Dec 1953, as a resident engineer during construction of the Vermilion Dam. In 1957 he joined the geotechnical group in San Francisco, where he became their lead tunneling expert. He moved into business development as Manager of Bechtel’s Transportation Engineering Group in 1970. **Dick Harlan** (BSCE ’52 Stanford; MS Columbia) came over from Dames & Moore in 1958 to work on Mammoth Pool Dam, then worked on Churchill Falls project in Newfoundland and Labrador, remaining until 1970.

In 1959 Australian geotechnical engineer **Thomas A. Lang**, PE joined the firm’s Hydro Division, after Bechtel had served as the prime contractor on the Snowy Mountains Hydroelectric Project in New South Wales, Australia. He became VP of Bechtel Pacific and Manager of Bechtel International, and in the 1970s assumed the presidency of Leeds, Hill & Jewett in SFO. One of those Lang hired was **Augustus C. Flach**, PE (BSCE ’38 Tulane). “Gus” Flach had been a grad student of Terzaghi and Casagrande at Harvard in 1939-40 before joining the Navy Seabees during the war. He then worked for TAMS on dams in Burma and France before joining Bechtel around 1960, where he remained until retirement.

 **Harris Burke’s** tenure as manager of the geotechnical group was succeeded by **Henry J. “Hank” Hunterman**, Jr., PE (1923-98), a decorated Marine Corps aviator in WW2, who also worked on the Swift Creek Project. When Hunterman retired (~1985), he was succeeded **Rudy J. Dietrich** (BSCE ’53 Washington Univ-St Louis; MS ’54 Harvard), who had worked for the Corps of Engineers and was a partner with Shannon & Wilson. Dietrich was succeeded by **Ignacio Arango**, PhD, GE(BSCE Columbia; PhD ’71 Berkeley) as Manager of the Geotechnical Group (Arango had previously worked for Shannon & Wilson and Woodward Clyde).

This ‘second generation’ of Bechtel’s geotechnical engineers in the 1960s-70s included: **Don Rose**, PE, CEG, **Ignacio Arango**, **Walter R. Ferris**, GE, **Don Dodds**, PE, **Ralph Talmage, R.C. “Dick” Harlan,** GE, **Herb Bensinger, Ron Bisio, Jack Blanck, Larry Tabor, Curtis Scott, Rob Fox, Robin Nowinski**, GE, **John Ross**, **G. Grant Cherrington**, GE (BSCE ’58 Toronto; MS ’63 Purdue) (1968-78), and **Daumantas “Mike” Namikas,** who became the ***Engineer-of-Record of more embankment dams in California than any other engineer.*** In 1990s their Chief of Earth Structures was **Richard L. Kulesza** (who joined the firm in 1963 to work on the James Bay Project in Ontario). Other senior geotechnical staff included **P.N. Sundaram**, GE (PhD ’78 Berkeley), who moved to Caltrans, **Mark Wahler**, GE(MSCE ’77 Berkeley), **David J. Umstot**, **Freddie Tajirian**, PE (MSCE ’76; PhD ’81 Berkeley) who later founded Seismic Isolation Engineering of Oakland, and **Patrick M. Griffin**, GE (BSCE ‘71; MS ‘72; PhD ’80 Berkeley). **Farhang F. Ostadan,** PE (BSCE ’75 Tehran Univ; MS ’79 Michigan; PhD ’83 Berkeley) joined Bechtel in 1985, replacing Ignacio Arango as Chief Soils Engineer of the San Francisco office in 2002, and became the firm’s Chief Engineer and a Bechtel Technical Fellow in 2012. **Annie Kammerer**, PE (BSCE ’94; MS ’98; PhD 2002 Berkeley) served as Bechtel’s Chief Seismologist in 2013-15.

**International Engineering Co. (1946-81); Morrison-Knudsen International (1981-91)**

 **International Engineering (IECO)** was founded by a group of Bureau of Reclamation engineers in Denver and Sacramento just after the Second World War, initially, to design Bhakra Dam in India (delivered in 1947). They used Reclamation projects as patterns (for example, Bhakra is a virtual copy of Shasta Dam). They also designed a number of domestic projects, such as Beardsley Dam on the Middle Fork of the Stanislaus River in Tuolumne County, completed in 1957. The firm employed structural engineers for design of concrete dams, and geotechnical engineers for design of rockfill and embankment dams, as well as a few engineering geologists. By the late 1950s they had projects in ten different countries. Their resident engineer on Bakhra, Punjab, and Karnaphulu Dams was **Stuart H. “Bart” Barrtholomew**, PE (BSCE ’48; MS ’53 Berkeley). By the 1970s they were designing some of the largest projects in the world, including Itapu Dam in Brazil, the world’s largest hydroelectric facility at the time.

 Some of the San Francisco principals included: **Richard E. Kohne**, PE (BSCE ’48 Berkeley) was Vice President, President, and CEO. **Gurmukh S. Sarkaria**, GE, NAE (BSCE ’45 Punjab Univ; MCE ‘47 Brooklyn Polytech; MS ‘48 Harvard; National Academy of Engineering ’81) joined the firm in 1956 and became the Senior Vice President. **Edwin S. Smith** was the firm’s Chief Soils Engineer in the early 1970s, succeeded by **Rodney D. Shaw** (BSCE ’65 Brighton; MS ’70; PhD ’73 Newcastle) in the late 1970s, **James P. Hawke**, PE was a senior engineer in the 50s and early 60s. Other senior staff included **James F. Lackey**, **Dean R. Schnaible**, **Patrick M. Griffin**, GE (BSCE ‘71; MS ‘72; PhD ’80 Berkeley), **Sunirmal Banerjee**, PE(MS ’77; PhD ’80 Berkeley; joined faculty Univ Washington), **Joe Long**, and senior engineering geologist **Dale L. Roberts**, CEG. In 1981 the firm was acquired by **Morrison-Knudsen**, and became **Morrison-Knudsen International**, until closing down in 1991. **G. Grant Cherrington**, GE (BSCE ’58 Toronto; MS ’63 Purdue) was a Project Manager from 1985-98. **Rick Nolting** PE, CEG (BS Geol ’66 VPI; MSGE ’70 CSM; PhD ’80 Berkeley) and **Fred Kintzer**, CEG (BA Geol ’69 Berkeley; MS ’70 CSU Hayward) also worked for Morrison Knudsen during the 1980s.

**Jacobs Associates (1955-2014); McMillen Jacobs Associates, Inc. (2014-present)**

 Founded as Jacobs & Associates in 1955 by **J. Donovan Jacobs**,PE, NAE(1909-2000) (BSCE ‘34, Minnesota) in San Francisco. Don Jacobs was elected to the NAE in 1969 for invention of the “tunnel sliding floor,”patented in 1959. The firm is well known for their expertise in tunneling and underground construction. In the 1960s the firm branched into developing construction estimating and scheduling services for heavy construction projects. Between **1963-1972** they were continuously involved in construction of the BART subway system, which extended the firm’s expertise, nationally.

 All of the early partners came from the ranks of heavy construction, most involved with tunneling. Early partners included **Alfred M. ‘Pete’ Petrofsky** (BSCE ‘50, MIT), **J. J. Daly**, **James L. Wilton** (BSCE ’50 Stanford), **John W. Nichols** (BSCE ‘50 MSM-Rolla), and **Howard B. Lewis** (BSCE ’51 Illinois; JD ’76 GGU), who founded the firm’s Washington, DC office. In **1970 Nichols** established their construction claims department, which eventually comprised half of the firm’s annual output. From 1968-75 and 1978-87 **Joseph Covello**, PE(BSCE ’63 RPI; MS ’64 Stanford) rose through the ranks to become pone of Jacob’s VPs before becoming joining Harris & Associates in Concord (1987-94).

 In the mid-1990s their principal engineers included: **Peter J. Lukins** (BEng Australia-Sydney; MEng ’82 Berkeley), President **William W. Edgerton**, PE (BA Eng Tufts; MBA GWU-Wash DC), **William H. Hansmire**,PE, NAE(BSCE ‘68 Nebraska; MS ‘70; PhD ‘75 Illinois) from PBQ&D (1977-2007), former firm president [1992-99] **Norbert A. Tracy**,PE (1936-2003)(BSCE ’72; MS ’73 Berkeley), **Rick Nolting** PE, CEG (BS Geol ’66 VPI; MSGE ’70 CSM; PhD ’80 Berkeley), **Daniel E. Kass** (BSCE UOP), CFO **Stephen J. Klein** (BSCE ’77 Illinois; MSCE ’79 Berkeley), **Michael T. McRae** (BSCE ’81; MS ’83; DEng ’94 Berkeley), **Victor S. Romero**, GE, CEG (BS GeoE ’90 CSM; MS ’91 Berkeley), **Carl W. Lafraugh**, PE (BSCE Cornell; MS Berkeley), **Bhaskar Thapa**, PE (BSCE ’82; MS ’84 Carnegie Mellon; PhD ‘93 Berkeley) (1963-2013), and **D.** **Scott Kiefer**, PE, CEG (BA Geol UCSC, MSCE ’93; PhD ’96 Berkeley), until he departed for CSM-Golden (and onto the Graz Univ Tech). From 2007-12 the Chief Operating Officer was **R. John Caulfield**, GE (BSCE ’83 Berkeley; MS ’84 Stanford), who moved to Jacobs Engineering Group in Oakland.

 In 1996 Jacobs established a Los Angeles office, and in January 1999 purchased St. Louis-based **Sverdrup Civil, Inc.** for $198 million. In a similar manner, Jacobs added offices in San Diego in 2002, Seattle in 2003 (purchasing **Milbor-Pita & Associates** in 2007), Las Vegas, and Boston in 2006. They also established an Atlanta office in 2010 when they purchased **Jordan, Jones & Goulding**. In 2002 **Bill Hansmire** became the second member of the firm to be elected to the *National Academy of Engineering*.

 In December 2014 **McMillen Jacobs Associates, Inc**. was formed as an employee owned holding company, with **Dan Adams** in Seattle serving as President/CEO and **Mara McMillen** in Boise as COO (of McMillen Associates). **Rafael Castro**, **Mort McMillen**, and **John Kaplin** rounded out the corporate leadership team serving as VPs for Corporate Development, Water Resources, and Construction Management, respectively. Jacobs Associates and McMillen will both continue as wholly owned subsidiaries of McMillen Jacobs Associates, with **Dan Adams** and **Mara McMillen** leading each. The combined resources of the merger provide clients access to 380 staff located in 19 offices across North America, New Zealand, and Australia.

**Leeds, Hill and Jewett, Inc. (1962-1978)**

 Leeds and Barnhard was founded in Los Angeles in March 1913 by Charles T. Leeds and Wilfred K. Barnard (described in the Southern California Threadline). This firm became **Leeds, Hill, Barnard and Jewett** (1940-46), then **Leeds, Hill & Jewett**, from 1946-78. **Charles T. Leeds** (1879-1960) was a Corps of Engineers officer who graduated #2 from West Point in 1903, just behind Douglas MacArthur. He served as the Corps’ Los Angeles District Engineer in 1909-12 and 1917-19. **Raymond A. Hill** (1892-1973; RCE 160) received his BCE from Michigan in 1914 and CE degree in 1922, after working for the Reclamation Service (1909-17) and serving in the Army Corps of Engineers during WW1 in France (1917-19). He moved to the Los Angeles area in 1913 and joined **Quinton, Code & Hill** in 1919. He served on the management board of ASCE and chaired the Rio Grande Compact negotiations in the 1930s. In 1940, he was elevated to partnership status, along with **John Q. Jewett** (1899-1973).

After the death of Charles Leeds in 1960, Ray Hill decided to move **Leeds, Hill & Jewett’s** headquarters from Los Angeles toSan Francisco, allowing the LA office to wither away during the 1960s. Retired CA DWR Director **Harvey O. Banks** (BSCE ’30 Syracuse; MS ’33 Stanford) joined the firm in January 1961, and served as vice president until 1969. Another senior partner, **Walter G. “Cliff” Schulz** (BSCE ‘35 Berkeley; retired DWR Chief of Design and Construction), managed the firm in the 1960s, while Harvey Banks concentrated on marketing. This team had worked with one another for many years previously (Banks and Schultz at DWR, with Hill on DWR’s California Water Project Advisory Board).

 The firm specialized in water resources engineering and hydropower schemes. In April 1965 Ray Hill was appointed by President Lyndon Johnson to the *Atlantic-Pacific Interoceanic Canal Study Commission*, charged with evaluating the practicality of using nuclear warheads to excavate a sea-level canal across the Central American Isthmus (the other members were Robert B. Anderson (chairman), Robert G. Storey, Milton S. Eisenhower, and BGEN Kenneth E. Fields. In accepting this post, Ray Hill felt obliged to retire (in April 1965) and named **Cliff Schulz** to succeed him as president, and he became Chairman of the Board (which he retained until shortly before his death, in 1973).

 Around 1969 Australian native **Thomas A. Lang** (BSCE ’32; MS ’33 Royal Melbourne Inst Tech) left Bechtel International to assume the presidency of the firm in the 1970s. Lang was known internationally as the “father of rockbolts,” which he pioneered to reinforce underground powerhouses for the Snowy Mountains Project in Australia in the 1950s (see T. A. Lang, 1972, Rock Reinforcement: *AEG Bulletin*, v.9:3, p. 215-239). Vice President **Albert C. Bardin** ran the day-to-day operations of the firm’s SF office, while his brother **Bill Bardin** was one of the supervising engineers. In 1968 **Jack G. Wulff**, PE (BSCE ’50 UNR) resigned his post as Chief of Earth Dams Design at CA DWR to become the firm’s Principal Engineer for Design and Construction (he went onto become President of Wahler & Associates, see above). **John R. Peckham**, PE, **Charles G. Wolfe**, PE (BSCE ’50 Berkeley), **James M. Lenhart**, **James S. Jenks**, **Jan Jacob Roggeveen**, **Walter A. Brown**, **Phillip G. Harris**, and **Dean R. Schnaible** were some of the principal and associate engineers at Leeds, Hill & Jewett in the early 1970s.

**Leedshill (1978-82); Leedshill-Herkenhoff (1983-90)**

 **Leeds, Hill & Jewett** specialized in water resources, dams, tunnels, and coastal engineering. Sometime in 1977-78, the firm started calling itself **Leedshill**.  The Dams and Tunnels Group of Leedshill was acquired by Woodward-Clyde in 1982, later on the same year, the remaining part of Leedshill - the Water Resources Group (hydrology and hydraulics) was acquired by Herkenhoff of Albuquerque, NM, and they operated under the name **Leedshill-Herkenhoff**. Their principal engineer was **Thomas C. MacDonald**, PE (BSCE ‘66; MS ’67; DEng ’74 Berkeley), with Senior VP **Bill Bardin**, PE (MSCE ’57 Stanford; Navy Seabee officer). The firm also operated a branch office in San Diego from 1985-87, lead by **Chuck Spinks**, PE (BSCE ’72; MSCE ‘73 San Jose State). In November 1990, the SF office of Leedshill-Herkenhoff was acquired by Kennedy/Jenks/Chilton (headquartered in SF). Leedshill-Herkenhoff maintained its home office in Albuquerque, which is still operating.

**The Mark Group (1983-99)**

 Formed in 1983 by **N. Dean Marachi**, PhD, GE (BSCE ’65 Oregon State; MS ’66; PhD ’69 Berkeley) and **David K. Rogers**, PE, CEG (BSGeE ’67; MSGE ’75 Nevada-Reno) of Converse Consultants’ San Francisco office (1974-84). By 1991 the firm had 98 employees and three offices. Their main office was located in Pleasant Hill, another in Livermore, and a southern CA office in Santa Ana. They performed water resources and geoenvironmental work, including construction management of environmental remediation. Their major clients were Lawrence Livermore National Laboratory, State of California, Sacramento Municipal Utility District, and the Corps of Engineers, among others. Some of their senior project engineers included **Christopher R. Nardi**, GE (MSCE ’81 Berkeley), **Corey Dare**, GE (BSCE ’77; MS ’78; MEng ’79 Berkeley) and **Mark. H. Stanley**, GE (BSCE ’88; MS ’90 Berkeley).

 In February 1999 they were absorbed by **Harza** **Engineering** **Co. of CA** (HECC) and moved to new offices in Concord. Marachi left Harza in April 2001, shortly before they merged with **Montgomery Watson** in 2002. When **Fugro West** purchased HECC in 2003, Dean Marachi began his own consultantcy while David K. Rogers remained with Montgomery Watson-Harza, which became **MWH-Americas**. Rogers then served as a Director with **MWH Energy & Infrastructure** until 2005, when he became senior project manager for the San Francisco Public Utilities Commission.

**William Cotton & Associates (1974-90); Cotton-Shires, Inc. (1990-present)** [in Leighton threadline]

 **William R. (Bill) Cotton**, CEG grew up in the oil producing hamlet of San Ardo, in the upper Salinas Valley. He attended San Jose State, receiving his BA in geology in 1962, and taught geology at Pasadena City College, alongside Harry Lawrence, CEG. Bill continued working on his master’s degree to gain tenure at PCC, while he and Harry worked part-time for **F. Beach Leighton**, a geology professor at nearby Whittier College. Bill completed his masters at San Jose State in 1967 and moved to the Bay Area in 1970 to work for the USGS Branch of Western Environmental Geology. In 1972 he began teaching geology at DeAnza College in Cupertino, while doing consulting work for Leighton on the Seal Cove Landslide problems in San Mateo County (he continued teaching at DeAnza College until 1992). In January 1974 Bill founded **William** **Cotton & Associates** in Los Gatos, providing the same style of engineering geology consultations that Leighton & Associates had been performing in southern California.

**Patrick O. Shires,** GE, PGP (BS Geophy ’72; MSCE ’75 Stanford) grew up in Porterville and came to Stanford as a premed major in 1968. After taking a geology course with Dick Jahns he switched his major to geophysics, earning his BS in 1972 and an MS in geotechnical engineering with Prof. Wayne Clough in 1975. After graduation he took a position with Earth Science Associates in Palo Alto and became registered as a civil engineer and geophysicist. The partnership between Bill Cotton, CEG and **Pat Shires** was established in 1984, but the firm didn’t change its name until 1990. It has always been based in Los Gatos.

Over the years, some of the senior staff included **Edward A.** “**Sandy” Hay**, PG (BA Geol ’57; MA ’61 Berkeley) and **N. Tim Hall**, CEG (BA Geol ’61 Hamilton College; MA ‘65 Berkeley; PhD ’84 Stanford), who were fellow geology profs with Bill Cotton at DeAnza College; **John Coyle** CEG (BS Geol ’75; MS ’85 SJSU), **David A. Cochrane**, CEG (BA Geol ’80 CSU Humboldt), **Bill Fowler**, CEG (BS Geol ’81 Colo Col; MS ’82 Stanford), **Bill Johnson**, CEG, **Bill Cole**, CEG, CHG (BS Geol ‘77; MS ’80 Texas A&M) came from McClelland Engineers inVentura, **Barry Milstone**, GE, CEG,(fm 1985-90), **Mike Pearce**, **David T. Schrier**, GE (BS Geol ’85; MSCE ’86 Stanford), **Ted Sayre** CEG (BA Geol ’81 Berkeley; MSGE ’85 CSM), **Philip L. Johnson**, CEG (BA Geol ’87 SFSU; MS ’90 SJSU), **Dale Marcum**, (BS Geol ’83 CWS-Gunnison; MSCE ’87 Berkeley). They have also employed a number of consultants, including **Philip A. Frame**, CEG (1946-2010) and Professors **Gerry Weber, Dick Goodman**, **Jonathan Bray**,and **J. David Rogers**.

Shires remains active in the firm’s management. As of 2009, **Ted Sayre**, CEG, **John M. Wallace**, CEG (BS Geol ’85 USC; MS ’91 SJSU) and **Michael Phipps** CEG (BS Geol ’87 USC) are the Principal Engineering Geologists, **Dale Marcum**, PE is the Principal Geological Engineer, and **David Schrier**, GE is the Principal Geotechnical Engineer. Other senior personnel include **Gordon Stolla**, CEG (BS Geol ‘98 CSU Humboldt), **Joe Durdella**, PG (BA Geol ‘97; MS 2001 Purdue), and **Tim Sneddon**, PE (BSCE 2000 CPSLO; MS 2001 Berkeley).

Some derivative firms include **Barry Milstone**, GE, who founded **Milstone Geotechnical** in 1990 based in Los Gatos; **John Coyle** was a consulting geologist for many years before moving to the Washington Dept of Natural Resources in 2007. In 2004 **Bill Cole** founded **Geoinsite**, **Inc.**, while **Steven F. Connolly, Gerry O’Regan**, and several others work for corporate entities.

**Branch offices of geotechnical firms based elsewhere**

**Kaiser Engineers (1946-94); ICF Kaiser Engineers and Constructors (1994-2000)**

 Founded in 1914, Kaiser Engineers moved its headquarters to Oakland in the 1950s. They did some of their own geotechnical and engineering geology work in the 1950s and 60s, and were heavily involved in all sorts of heavy construction projects, including power plants and mining. In the late 60s-early70s their Chief Soils Engineer was **Harold C. Shandrew**, PE. **Edgar (Ed) Becker** (BSCE ’52 Berkeley; MBA Columbia; PhD ’72 Berkeley), after leaving Lee & Praszker to pursue his doctorate at Berkeley on the deformation of rock fill materials for Oroville Dam (1969-71) he became Chief Geotechnical Engineer for Kaiser Engineers. **Alden McElrath**, Jr. was a staff geotechnical engineer and **Lynn E. Morlan,** CEG was their engineering geologist. Kaiser gradually transitioned to using **Shannon & Wilson** for much of their geotechnical work, especially, nuclear power plants.

In 1989 Kaiser Engineers purchased **Tudor Engineering Co.** of San Francisco, founded by **Ralph A. Tudor** (1902-63) (BSE ’23 USMA; CE ’25 Cornell) in 1950. Tudor had a large role in the construction of BART between 1964-75, in the joint venture Parsons-Brinkerhoff-Tudor-Bechtel. The conjoined firm was renamed **ICF Kaiser Engineers.** In 1993 the firm name changed to **ICF Kaiser Engineers and Constructors**, with offices in Oakland and San Jose. In late 1993 they moved their corporate headquarters from Oakland to Fairfax, VA. **Hatch Mott MacDonald** (described below) acquired ICF Kaiser Engineers in 2000.

**Shannon & Wilson (1965-80)**

 Based in Seattle, WA, Shannon & Wilson opened a SF Bay Area branch office in Burlingame in 1965, led by Senior Vice President and partner **Rudy J. Dietrich** (BSCE ’53 Washington Univ-St Louis; MS ’54 Harvard; at WES-Vicksburg then onto Bechtel) with **Delmar D. Yoakum** (BSCE ’62 Washington; MS ’63 Harvard) as senior associate, and **Ed Rinne** (BSCE ’61; MS ’63 Berkeley) as their first staff engineer (moved to D&M in 1968). Dietrich was succeeded by **J. Ronald Salley** (BS, ‘62; MS ‘63 Harvard; PhD ‘67 Illinois), who moved the office to 350 Sansome Street in San Francisco.

 Other senior staff at the Bay Area office included **Ignacio Arango** (BSCE Columbia; PhD ’71 Berkeley), **Chris Groves** (BSCE ’68; MS ’69 Missouri-Rolla); **Allen W. Hatheway** (BA Geol ’61 UCLA; MS GeoE ’66, PhD GeoE ’71; PD ‘82 Arizona), **Pedro A. De Alba** (BSCE ’64 UNAM; MS ’69, PhD ’75 Berkeley), **P. Erik Mikkelsen** (BSE ’64 [Schous Tekniske Institut](http://www.facebook.com/pages/Schous-Tekniske-Institutt/166713966698540); BSCE ’66 Utah; MS ’67 Berkeley), **Robin B. Nowinski** (BSCE ’64 Stanford; MS ’69 Berkeley), and **Robert D.** “**Bob” Perry**. Hatheway held a PhD in geological engineering from Arizona, while Arango and DeAlba received their PhDs in geotechnical engineering from Berkeley.

 The office‘s largest client was **Kaiser Engineers**, based in Oakland. They did lots of work for Kaiser on nuclear power plants, some work for the Union Pacific Railroad (a long-time client of S&W), and the geotechnical work for the second Dumbarton Bridge in 1973 for the Southern Pacific Railroad (then headquartered in San Francisco). When the San Francisco office was closed in 1980, Office Principal **Ron Salley** transferred to the St. Louis office of S&W and went onto Seattle as President of the firm in the 1990s.

**Thomas M. Leps, Inc., Consulting Engineers (1963-94)**

 **Thomas M. Leps**, PE, NAE (1914-2010) was born in Keyser, West Virginia in December 1914 and his family moved to Palo Alto in the early 1930s. He attended Stanford University, where he received his general engineering degree in 1936. He worked two years for the Bureau of Reclamation in Nebraska before attending graduate school at MIT, where he received his master’s degree in civil engineering with an emphasis on soil mechanics in 1939. He then worked for DeLeuw Cather Company and the Army Corps of Enmgineers before joining the Navy Seabees during the Second World War, achieving the rank of commander. After the war, he took a position with the **Southern California Edison Company**, engaged in constructing dams for hydroelectric power development in the Sierras. During the next 16 years he established himself as an expert on the strength and deformability of rockfill embankment dams, publishing approximately 30 articles during his professional career. He rose through their ranks to become Chief Civil Engineer, before leaving to become Chief Engineer of **Shannon & Wilson**, between 1961-63.

 In 1963 he established his own consultancy in Atherton specializing in geotechnical engineering. He was named to the Baldwin Hills Reservoir review panel convened by the Department of Water Resources in December 1963. He served as a consultant on many dam and hydroelectric projects around the world, including the New Exchequer, Palmdale, Lopez, Los Angeles, and New Spicer Meadows Dams in California. He incorporated his firm as **Thomas M. Leps. Inc.** in March 1971. He was elected to the *National Academy of Engineering* in 1973 and was a frequent guest lecturer at Stanford for three decades (1963-94). In June 1976 he was named to the ***Independent Panel to Review the Causes of the Failure of the Teton Dam*** by the Governor of Idaho. He received the ***Lifetime Achievement Award***of the U.S. Society of Dams in 2006. His wife Catherine died in November 2005, and sometime after this he moved to Dinuba. He then moved to Lake Forest, in Orange County, where he died on April 23, 2010.

**F. Beach Leighton & Associates (1970-74; Leighton & Associates (1974-81)**

 F. Beach Leighton & Associates was based in Whittier, and later, Irvine, in southern California (profiled in the Southern California Threadline). They opened a field office in the San Francisco Bay Area in September 1970, out of Bill Cotton’s home in Los Gatos (he was working for the USGS in 1970-72), because he had previously worked for the firm while teaching geology at Pasadena City College (1962-70). **Bill Cotton**, CEG assessed the landslide problems in Seal Cove for San Mateo County (see County Geologist write-up, below).

 In 1974 Cotton established his own consultancy (profiled above) and Leighton established a branch office in Redwood City to service his clients in the San Francisco Bay region, re-oraganizing itself as Leighton & Associates. **F.** **Beach Leighton**, PhD, CEG (BSEng ’46 Virginia; MS Geol ’49, PhD Geol ’51 Caltech) served as the reviewing geologist for San Mateo County under contract, from 1970 until **Al Neufeld**, CEG was hired as the full-time County Geologist, in 1975. In the summer of 1974 **Sally Widhelm Bilodeau**, CEG, CHG (MS ’76 Stanford) came up from Leighton’s home office in La Habra to work part-time in the Redwood City office while attending grad school at Stanford (1974-76), and she managed the Bay Area office until 1977. **Sterling Atkinson**, PE, CEG (1928-96) succeeded Bilodeau as the office manager in 1977. Other geologists who worked in the Redwood City office included **Rod Weick, Paul Newman,** and **Richard Harris.** After Leighton’s branch office closed in 1981, Atkinson and Tom Tejima formed Tejima–Atkinson (profiled above) in 1984.

**Joseph A. Ward & Associates (1973-78)**

 In 1973 Joseph A. Ward & Associates opened a branch office in San Francisco, with **Gene Miller** of Harding Miller Lawson Assoc as the managing principal. The firm was based in Caldwell, New Jersey, with other branch offices in Washington, DC and Tampa. In 1978 Converse-Davis & Associates of Pasadena merged with Joseph S. Ward & Associates and became **Converse-Ward-Davis-Dixon**, making them a coast-to-coast geotechnical firm. At that time the Washington, Tampa, and San Francisco office of Joseph S. Ward and Associates was also absorbed into the new firm. **Joe Ward** (1925-94) (BCE ’46 Manhattan College; MS ‘48 Rutgers) stepped down as President and CEO of the firm in 1983 and retired to Florida, where he died of a heart attack in January 1994. The firm name changed its name to **Converse Consultants West** around ~1983.

**Converse Ward Davis Dixon Associates/Converse Consultants** **(1979-99); Converse Environmental West (1989-99)**

 Converse Consulting Foundations Engineers was established in 1946 and headquartered in Pasadena, CA. This became Converse, Davis & Associates in 1966. In 1978 **Converse Ward Davis Dixon** **Associates** joined with Joseph A. Ward & Associates to become **Converse-Ward-Davis-Dixon. Ward’s** branch office in San Francisco assumed this new name in March 1979, and **Gene Miller**, GE continued managing the SFO office, having joined Joseph A Ward in 1973. **N.** **Dean Marachi** rejoined the firm at this time, after returning from Iran in Dec 1978 (he had previously worked for Converse in Pasadena, between 1969-73). In February 1982 Marachi took over management of the SFO office, when Gene Miller left to form Harlan-Miller-Tait.

In 1983 the firm name reverted to **Converse Consultants** because Schaffer Dixon started his own firm in April ’82 and the founding partner, J. Robert “Bob” Davis, died of bone cancer in July 1982. In 1983 Marachi and **David K. Rogers**, PE, CEG departed to form The Mark Group (profiled above). **Richard J. Woodward**, **III** (MSCE ’64, PhD ’66 Berkeley) succeeded as principal of the SFO branch office (he went onto become head of the hazardous waste group at Brown & Caldwell in Pleasant Hill). The senior geotechnical engineers at the San Francisco office included **Pat Lucia**, PhD, PE (1980-83) and **Corey T. Dare**, PE (1979-89), while their staff geologist was **Mike Carey**, CEG (BA Geol ’75 UC Davis). Their bay area office was closed in 1999.

**Geotechnical Engineering, Inc. [GEI] (1979-present)**

GEI Geotechnical Engineering, Inc. was established in 1979 in Fremont by **Taghi Manbeian**, PhD, PE (PhD ‘72 Berkeley) and **Alan S. Boris**, GE (BSCE ’61 UCLA). **John N. ‘Jack’ Alt**, CEG (BA ’68 Geol SJSU) and **Michael N. Clark**, CEG (BA Geol ’77; MS ‘78 UCSB) have served as the firm’s principal/contract geologists at various times. Jack Alt went onto open his own consultancy Epigene International, and Michael Clark moved to Kleinfelder’s San Jose office.

**CH2M Hill (1982-2015); CH2M (2015-17); Jacobs Engineering Group (2017-present)**

 CH2M-Hill was formed by the 1971 partnership of **Clair A. Hill & Associates** of Redding with **CH2M** (Cornell, Holland, Hays & Merrifield) of Corvallis, Oregon. Both firms were founded in 1946. **Clair A. Hill**, PE, NAE received his BSCE from Stanford in 1934 and established his first consultancy in Redding in 1938, while serving as Deputy Surveyor for Shasta County. He was the longest serving member of the California Water Commission (from 1949 to 1996), and was elected to the ***National Academy of Engineering*** in 1992.

CH2M-Hill established a branch office in Emeryville in 1982 that was managed by **Loring E. Hanson** (BSME ’45 Berkeley), who retired in 1984. **John E. Anderson**, GE (BSCE; MS, PhD Northwestern) was named Emeryville’s senior geotechncial engineer in 1987, and became the firm’s Chief Geotech Engineer in 1999. The Emeryville-Oakland office was engaged primarily in water resources and geoenvironmental work. The office moved to Oakland in 2000. **Don V. Roberts**, GE (BSCE ’50 Stanford), a partner at Dames & Moore’s Los Angeles office, was brought in as Vice President and Director of Corporate Planning and Development. In the 1990s Senior VP and Principal Geotechnical Engineer was **Lawrence H. Roth**, GE (BSCE ’70; MS ’74 Wisconsin) until 1998, when he joined ASCE’s national staff (through 2009). Other senior geotechnical engineers included **Howard Schirmer**, GE (BSCE ’64, MS ’65 Berkeley) who became President of CH2M International in Denver in the 1990s. **Jill T. Sideman**, PhD was the firm’s San Francisco Bay Area manager between 2004-10; when **Vijay Kumar**, PE (MSCE ’89 Hawaii) took over the managerial role of the 450 employees working in the Bay Area. From 2000-16 their senior engineering geologist was **Paul F. Bertucci**, CEG (MS Geol UC Davis).

In February 2015 the firm’s board of directors decided to delete “Hill” from their corporate branding, becoming “CH2M” (except at the Redding office). Pasadena-based **Jacobs Engineering Group**, Inc (founded in 1947) acquired CH2M for $3.27 billion in a cash and stock acquisition on Aug 2, 2017 (Jacobs moved its corporate headquarters to Dallas, TX in the fall of 2016). Jacobs the sold the mining and petroleum divisions and shuifted from being an oil-field engineering services firm that dabbled in certain facets of hydrology into one of the largest water resources and geoenvironmental (waste water) consultants.

**BSK Associates (1982-present)**

 BSK Associates was founded in 1966 in Fresno, California by **Wes Braun**, PE, **Robert Skaggs**, PE, and **Hugo Kevorkian**, PE as a full-service geotechnical engineering company. In 1977 they established **BSK Analytical Laboratories** as a division of BSK to analyze water quality, becoming an AICL certified facility. By the mid-1980s they were providing a range of environmental, geotechnical and construction testing and inspection services. The branch manager in Fresno is **Danny Cohen**, GE. **Jim Olbinski**, CEG (BS Geol ’76 NAU; MS ’83 Oregon State) was the firm’s senior geologist until retiring.

 Over the years they established branch offices in Bakersfield, Visalia, Pleasanton/Dublin, and Sacramento. The branch office in Pleasanton opened around 1982 and was managed by **Howard D. Barlow**, GE, who also operated a separate entity incorporated as **JHA Geotechnical** in 1984 (profiled below). Since Feb 2006 the firm’s president has been **Richard Johnson**, CEG (BS Geol ’83 CSU Chico).

 In 2013 **Bradley E. Steen**, GE (BSCE ’76; MS ’77 Berkeley) left Kleinfelder to become manager of BSK’s branch office in Dublin. One of their senior geotechnical engineers is **Carrie Foulk**, GE (BSCE ’96 Washington; MS 2002 Berkeley). In Aug 2013 **Christiano Melo**, GE (BSCE ’97; MS 2000 Idaho) departed Kleinfelder to become the Geotechncial Group Manager for BSK’s San Francisco office and laboratory.

**JHA Geotechnical Consultants, Inc. (1984-91)**

 JHA Geotechnical was founded by **Howard D. Barlow**, GE and **Hugo Kevorkian** of BSK Associates in April 1984, and based in Pleasanton. They soon moved to Hayward, where they operated until May 1991, when the corporation was dissolved. Their staff geologist was **Dale E. Plume**. They performed numerous geotechnical and engineering geologic studies for hillside residential development in the East and South Bay areas. Barlow moved back to Fresno in 1991 and resumed his position as a principal with BSK Associates at their home office.

**Environmental Geotechnical Consultants (1986 – present); Pyramid Geotechnics (1990s-present)**

Environmental Geotechnical Consultantswas founded by San Francisco native **Donald R. Poindexter**, GE (BSCE ’69; MS ‘74 Minnesota), a former partner with BSK Associates in the 1980’s, who then worked as an associate with Purcell-Rhoades in Pleasant Hill. In 1986 he established **Environmental Geotechnical Consultants** in Pleasant Hill, which he sold his interest to **John T. Phillips**, CEG in 1992, who with **Noel Lerner**, PE, operated the firm from an office in Sacramento. **John F. Hicks**, PE now owns the firm, which is based in Hayward. In the mid-1990s Poindexter moved to Petaluma and established **Pyramid Geotechnics**. In 2006 Poindexter incorporated Pyramid and moved the business to Bodega Bay.

**Golder Associates, Inc. (1986-present)**

 Golder Associates North American operations are headquartered in Toronto. They established a branch office in Alameda around 1986, now located in Sunnyvale, with about 20 employees. They were primarily engaged in performing geoenvironmental assessments and remediation. **Ajay Singh**, GE (now with BAGG) and **Craig A. Hall**, GE, who went on to Kleinfelder, Treadwell & Rollo, and GEI Consultants, were senior engineers, while **Shah Vahdani**, GE (MSCE ’79 USC; PhD ’83 Berkeley) was an associate engineer in the mid-1990s. In 2005 Golder acquired **Conor Pacific/ EFW** and expanded their market share in the S. F. Bay area. **Bill Fowler**, CEG (BA Geol ’80 Colorado College; MS ’82 Stanford) of Einarson, Fowler & Watson joined the firm as an associate in 2004, and became their principal geologist in 2013.

**Geosyntec Consultants (1991-present)**

 The firm was established in 1983 by **Jean-Pierre Giroud** PhD, NAE and **Joe Fluet** (both fromWoodward-Clyde Consultants) and based out of Boca Raton, FL. They specialized in providing consulting services in geosynthetics, mostly for the emerging geoenvironmental industry (Giroud coined the term “geotextiles” as a Professor at the University of Grenoble in 1977). In 1986-87 Drs. **Rudy Bonaparte** (BSCE ’77 Texas; MS ’78; PhD ’81 Berkeley) and **Neil D. Williams** (BSCE ’77; MS ’79 Utah State; PhD ’82 Berkeley) joined the firm and it grew rapidly soon afterwards, from headquarters in Boca Raton, particularly, in support of landfills, working for Browning-Ferris Industries and other waste disposal clients.

 By 1995 the Principals included **J. F. Beech, N.D. Williams, J.P. Giroud, T.R. Sanglerat**, **Jeff Dunn, Pat Lucia,** **Rudy Bonaparte**, NAE and **Ed Kavazanjian**, NAE (BSCE ’73 and MS ‘75 MIT; PhD ’78 Berkeley). **Thierry Sanglerat** opened a branch office in Southern California (Huntington Beach) and Kavazanjian left Stanford to join the firm and began managing that office in 1992. **Jeff Dunn** PhD, GE (now with ARUP) opened the Geosyntec office in Walnut Creek in 1991, which has continued to grow, and is now in Oakland. **Patrick C. Lucia**, GE (BSCE ’74; MS ’75, PhD ’81 Berkeley) joined this office in 1993, coming from Woodward-Clyde, where he had served as a principal and VP. Senior associates included **Scott Huntsman**, GE (BSCE ’75; MS ’76; PhD ’85 Berkeley) (since moved to Black & Veatch), and **Nancy Tannaci Bice**, CEG (BA Geol ’79; MSCE ‘82 Berkeley). **Lucia** served as Chairman from 1994-2013, while **Rudy Bonaparte** is President and CEO of the parent firm, at their Atlanta headquarters. **Bonaparte** was elected to the ***National Academy of Engineering*** in 2007, **Giroud** in 2009, and **Kavazanjian** in 2013. **Lucia** retired in 2013 and held an adjunct faculty position at UC Davis before passing away in Nov 2018.

 Their Bay Area office includes **Christopher Hunt**, GE (BSCE ’93; MS ’95; PhD GeotE 2000 Berkeley); **John Gallinatti**, CHG (BS Geol ’79 Stanford; MS ’84 Washington); **Jennifer Donahue**, PE (BS OceanE 1995 Texas A&M; MSCE 2003; PhD 2007 Berkeley); **Lelio Mejia**, GE (BSCE Xavier; MS ’78; PhD ’81 Berkeley) retired from AECOM and joined the Oakland office in 2016.

**Harza Engineering (1992-2001)/MWH Americas, Inc. (2001- present)**

 Harza Engineering of Chicago and Montgomery-Watson of Pasadena merged companies in June 2001 to become MWE Americas, Inc. In the San Francisco Bay region Harza ECC acquired **Kaldveer Associates** in 1992 and the **Mark Group** in 1999. These were grouped together with Montgomery Watson’s office in Walnut Creek, while they operate another branch office in San Francisco (13 offices in CA altogether). MWH Americas, Inc is a subsidiary of MWH Global, Inc., which has 170 offices and more than 7,000 employees around the world (headquartered in Bloomfield, CO). Another subsidiary firm is MWH Constructors, Inc., offering construction management services.

**Haley & Aldrich (1994 – present)**

 Haley & Aldrich is a Boston-based firm founded in 1957 by James F. Haley and Dr. Harl P. Aldrich, PE, NAE which currently employs 600 people in 30 offices, nationwide. They established a San Francisco branch office in 1994, when they secured a contract to manage construction of the Richmond [sewer] transport tunnel in San Francisco. The firm now sports branch offices in Oakland, Walnut Creek, and San Jose, with a combined staff of about 40 people. They specialize in geoenvironmental assessesments and remediation, mostly on redevelopment of legacy sites. Some of the principals include **Susan Gallardo** GE (BSCE ’80; MS ’84 Berkeley) as Senior VP and Principal Consultant (from AMEC/Geomatrix), Principal Hydrogeologist **Murray D. Einarson**, CEG, CHG (BA Geol ’82 UCSB; MS 2001 Waterloo) (from AMEC). Einarson, Fowler, and Watson joined the firm in 2012. **Peter Bennett**, CHG (MS Geol ’98 Western Ontario) is VP and Lead Hydrogeologist; **Adrian Fure**, PE (BSEnE 2001 Michigan Tech; PhD EnvE 2005 Florida) is senior remediation engineer; **Peter Scaramella**, PE (MSCE 2007 Colorado) is senior risk assessor, **Jennifer Duffield**, PE (BSCE ’93 UCLA, MS ’95 Berkeley) is senior project manager. In February 2016 **Catherine Ellis**, G.E. (BSCE UOP; MS SJSU; MBA Berkeley) was named Senior Client Leader in the firm’s Walnut Creek office.

**GEI Consultants (1994-present )**

 GEI Consultants, Inc. of Woburn, MA purchased Roger Foott & Associates in 1994, establishing a branch office in San Francisco. **Frederick N. Brovold**, GE (BSCE 65; MSE ’67 Florida; CE ’71; MS ’71 MIT) served as the Branch Manager from 1995-99, and **Roy A. Bell**, GE as Senior Project Engineer (see Roger Foott & Associates and Harding Lawson). **Gilles J. Bureau**, GE (Dipl Nat’l Upper Mining Sch (France); MSCE ‘71 Berkeley) departed URS/Woodward-Clyde in 2003 to become a senior consultant to the Oakland office. **Mark Freitas**, GE became principal engineer of their San Francisco office in August 2009. **Kyle Bickler**, GE, **Michelle Shriro**, GE (BS EnvE 1997; MSCE ’99 Berkeley), and **Enrico Rufini** (BS Geol ’89 Univ Perugia; MSCE ’98 Berkeley) are senior geotechnical engineers, and **Graham Bradner**, CEG, CHG (BS EnvGeol 1999; MS Hydgeol 2002 Clemson) is a senior hydrogeologist. In 2016 **Craig A. Hall**, GE (BA Geol ’85 UCSB; MSCE ’88 Berkeley) affiliated with the firm as a principal geotechnical engineer, and led their study of the Oroville Spillway project.

**Arup & Partners California Ltd. (1995-present)**

**Ove Arup** was founded in 1946 and is headquartered in London. It currently goes by the name Arup and operates out of 73 offices in 32 countries, with 7000 members of staff. Arup is made up of a number of inter-related practices. Around 1995 they established branch offices in San Francisco and Los Angeles as Ove Arup & Partners California Ltd. **Annie Kammerer**, PhD, PE (BSCE ’94; MS ’98, PhD 2002 Berkeley) established the geotechnical group at this office in 2002, remaining till 2006. Principal SF office contact is **Mike Kaye**. **Demetrious Koutsoftas**, GE, NAE (BS AgEng ’68 Technion-Haifa; MS ’71 and CE ’72 MIT) joined as a senior associate in 2006. They provide civil, structural, geotechnical, mechanical, and electrical engineering design services. In 2007, the San Francisco office grew to a whopping $30 million in revenue -- nearly double its 2005 total. In 2010 they were joined by **Daniel J. Peluso**, GE (BS Geol ’83 UCSB; MSCE ’87 SJSU) from Pacific Geotechnical Engineers. In 2013 **R. Jeffrey Dunn**, GE (BSCE ’75; MS ’76; PhD ’83 Berkeley) came over from Kleinfelder to head up the firm’s geotechnical engineering division in the S.F. Bay Area.

**Ninyo & Moore (1999-present)**

 Founded in 1986 by **Avram Ninyo** (BSCE ’71 Robert College-Istanbul; MSCE ’74 Syracuse), who managed Leighton’s branch office in San Diego, along with **Roy E. Moore**, (son of William Moore of Dames & Moore), based out of San Diego. A branch office was established in Oakland in 1999. **Terrance K. L. Wang,** GE (BSCE ’75 Rice; MS ’76 Berkeley) left Fugro West to become managing partner of the Bay Area office in August 2005.

**Fugro (1972-75); Fugro West, Inc. (1997-2010); Fugro Consultants, Inc. (2010-present)**

Fugro was founded in September 1970 by **Jaap “Jack” Schoustra**, PE (1931-1997) (BS, MS Delft Tech Univ) and **Jay Smith** (BS Geol ‘58 UCLA), who were both partners at Converse-Davis in Pasadena. **Fugro Inc**., the American affiliate of the Dutch firm established an office in Long Beach. In 1972 they established a Bay Area office in Redwood City, bringing in **Howard F. Donley**, PE (BSCE ’60 Wyoming; MS ’61 Montana State) from Dames & Moore as a vice president and office principal. Donley had joined D&M in 1963. This officen remained open until he formed Howard F. Donley & Associates in 1975 (described in the D& M threadline).

 McClelland Engineers of Houston, Texas was founded in 1947. In 1977 McClelland partnered with Land and Sea Surveys of Louisiana to establish a West Coast office in Ventura to service the offshore oil industry (Land BS Sea Surveys had been working in California since 1950). Fugro is a European-based company founded in 1962 in the Netherlands. In 1986 Fugro merged with McClelland Engineers to form **Fugro-McClelland**, which allowed them to dominate marine and offshore geotechnical exploration and assessment, while offering geotechnical, hydrogeologic, geoenvironmental services.

In 1991-92, Fugro acquired KC Geotechnical Engineers of Santa Barbara and Staal, Gardner & Dunne of Ventura (profiled in the Southern California Threadline). When Fugro acquired John E. Chance of Louisiana in 1994, their Ventura operation (formerly Land and Sea Surveys) became a part of Fugro-McClelland West, which became **Fugro West, Inc.** in November 1997, with Timothy N. Dunne, GE serving as the president, in Ventura.

In 1997 Fugro West established a branch office in Oakland, which was managed by **Tom McNeilan**, PE (BSCE ’73 Cincinnati; MS ’74 Purdue), who had previously worked for McClelland Engineers in Houston, San Francisco, and Ventura before becoming VP of Fugro West in 1993. Their Chief Geotechnical Engineer is **Ron Bajuniemi**, G.E (BSCE ’71; MS ’73 UC Davis), and from 2002-12 one of their principal geotechnical engineers was **Corey T. Dare**, GE. Their VP and principal geologist is **William Godwin**, CEG. In 1998 they landed the $12.5 million geotechnical exploration contract for the San Francisco-Oakland Bay Bridge East Span, which eventually expanded to $18 million. McNeilan supervised site characterization for the new bridge, which reduced the cost of the pile foundations by $200 million, and was constructed without *any* changed conditions claims.

 Fugro West's Bay Area operations were significantly expanded with the acquisition of Subsurface Consultants (SCI) in 2002 and the infrastructure operations of MWH Energy & Infrastructure, Inc. (MWH E&I) and the Oakland office of Harza (also in 2002); and Lettis & Associates in 2007. In 2010 Fugro West (which included all of Fugro’s operations in California and Nevada and headquartered in Ventura) was recaptured in the national organization known as **Fugro Consultants, Inc.** (FCL), headquartered in Houston.

 In January 2008 Fugro West, Inc. landed a contract to assess 1200 miles of ''non-urban'' levees in California's Central Valley. Fugro is part of two teams that have been awarded contracts with the California Department of Water Resources (DWR). The total contract value for both contracts over five years is $120 million. Fugro's share is approximately $35 million.

**Geosphere Consultants, Inc. (2007- present)**

 **Eberhart/United Consultants** was originally formed by **Dan Eberhart**, CEG in 1985 in Placentia (described in the Southern California threadlines). Geosphere Consultants was founded in 2007 when Eberhart/United was combined with the Geotechnical Division of **Consolidated Engineering Laboratories**. Geosphere Consultants operates offices in San Ramon, Salt Lake City, and Honolulu, and is an independent firm within the Engineering Testing Services Corporation (ETS) family of companies, an ENR 500 firm. The firm’s principals include: President **Eric J. Swenson**, GE, CEG (BA Geol ’87 Berkeley; MSCE ’94 SJSU), Principal Engineer **Corey T. Dare**, GE, Senior Geotechnical Engineer **Greg R. Hanson**, GE, CEG (BS Geol ’70 Illinois), and Senior Pavement Engineer **Raghubar Shrestha**, PE.

 In January 2017 the firm was re-structured and **Corey T. Dare**, GE (BSCE ’77; MS ’78; MEng ’79 Berkeley) was named the Managing Principal Engineer, **Marlene K. Jackson**, GE (BS Geol ’83 Harvard; MSCE ’90 Berkeley) came aboard as their Principal Geotechnical Engineer, and **Raghubar Shrestha**, PE (BSCE ‘91 Tribhuvan Univ; MS 2003 South Dakota; PhD 2006 UN-Reno) continuing as senior pavement engineer. Staff engineers include **Jose Garcia**, **Nicholas Anastasio**, and **Alex Lim**.

**Hatch Mott MacDonald (2009-present)**

 In 1996, the English firms Hatch Ltd. Of Toronto and the Mott MacDonald Group of Croydon, UK, combined forces to form **Hatch Mott MacDonald** to provide comprehensive engineering design and construction management of transportation systems, including tunnels, rail transit, bridges and highways, and aviation in North America. In 1996, Hatch began ecquiring other North American firms, including Billiton Engineering (1996), Rescan Mining (1998), BHP Engineering (1999), Kaiser Engineers (2000), and Acres International (2004). Hatch Mott MacDonald’s American headquarters is located in Iselin, New Jersey. HMM’s staff of 2,700 operates from 76 branch offices in Canada and the USA.

 The firm’s branch office in Pleasanton was established in 2009 (moving to the Hacienda Business Park in January 2011) to service contracts with the San Francisco Public Utilities Commission as construction manager for their New Irvington Tunnel $4.6B project, and on the Calaveras Dam replacement project. The office is also providing consultations for the Transbay [Rail] Transit Center in San Francisco, and the California high-speed rail tunnel investigations. The office principal is **John Davenport** and **Ray Akkawi** is a senior project manager. **Scott Ball**, CEG (BS Geol ’83 BYU; MS GeoE ’85 MichTech) is working on the Irvington Tunnel and Calaveras Dam.

**Geo-Engineering Solutions (2017-present)**

 In January 2017 **Eric Swenson**, GE, CEG (BA Geol ’87 Berkeley; MSCE ’94 SJSU) founded Geo-Engineering Solutions out of San Ramon. Their project engineer is **Colin Frost**, PE and staff geologist is **Elizabeth Peters**.

**Other firms/Consultants (without defined threadlines)**

**LACO Associates (1954-present)**

 General civil engineering, surveying, soils mechanics, and materials testing firm founded in Eureka around 1954, by unknown individuals. It was reorganized in 1975, and again in 1982, to its present name and livery, with offices in Santa Rosa, Ukiah, and Eureka. From 2000-10 the firm’s president was **Leonard Osborne**, PE (BSCE ’81 Utah), VP was **Tim Hoover**, **John L. Bergenske** was COO, **David N. Lindberg**, CEG (BS ’81; MS ’89 HSU) was senior engineering geologist, and **Philip Taylor**, PLS. **Jared Chaney**, **David Lindberg**, **Frank Bickner**, and HSU Prof. **Gary Carver** did some of the original work on the Cascadia Subduction Zone (see Chaney, R., Carver, G., Bickner, F., Conversano, G., Lindberg, D. 1991. "[***Seismic Risk Analysis for a Site Along the Gorda Segment of the Cascadia Subduction Zone***](http://lacoassociates.us/sites/lacoassociates.us/files/SeismicRiskAnalysis.pdf)***,***" Second Int’l Conf Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, Vol II, 1313-1321).

#  In 2010 the firm was restructured again, after Osborne and Bergenske moved to Redding. Current officers and senior principals include: President and CEO Christopher J. Watt, CEG, CHG (BS Geol ‘1995 HSU) joined the firm in 1997; Frank Bickner, PG; Nathan Toews, PE, Bryan E. Dussell, CEG, David Nicoletti, PE, John Erich Rauber, GE (manages Santa Rosa office), and materials testing and lab manager Virgil Garner. Their senior engineering geologist is Gary Manhart, CEG (BS Geol 1991 Humboldt State) working out of the home office in Eureka. The firm maintains four offices, in Eureka, Ukiah, Santa Rosa, and Chico. They perform Phase I/II ESAs, fault hazard and foundation evaluations, and slope stability assessments.

**Geohydrologic Consultants (1965-unkn)**

 Geohydrology Consultants was a small consulting firm founded by **John H. Scheufler** (BS Geol ’52; MS ’54 Wayne State; PhD ’72 Colorado) in 1965 and based in Saratoga, while Scheufler was working for Standard Oil Co. of California. A separate firm of the same name was later founded in 2001 by Richard A. Vogl, CHG, CEG, and is based in southern California.

**Judd Hull & Associates (1974-82)**

 In the late 1960s-early ‘70s **Judd R. Hull**, PE worked as one of **Raymond International’s** SF Bay Area representatives, under **L. F. Cavin**. In 1974 he started his own firm based in Hayward. His first employee was geologist **Mike Hansen**. It closed shortly after Mr. Hull’s untimely death in March 1982, at age 53. Hull also maintained a partnership with contractor **Robert W. Smith** as **Hull-Smith Earth Movers**, which was based in Pleasanton. They performed geotechnical site preparation work and landslide repairs, and Smith continued operating Hull-Smith for some time after Hull’s death.

**Rose Geotechnical** (1960s) performed several geotechnical reports for BART in the mid-1960s, based out of San Francisco. This may have been former Bechtel geotechnical engineer **Edward Rose** (BSCE and Geology ~1951 Berkeley), who joined Bechtel’s SF office in 1953. He worked for Bechtel for 25 years, split between San Francisco during the 50s and early 60s, and later in Los Angeles, as Manager of Geotechnical Services in the 1970s.

**Geotechnical Consultants Inc. (GTC) (1964-2019)**

Founded in 1964 by **C.** **William (Bill) Schmidt,** **Russell G. Hood**, **Glenn Brown** CEG, **Joseph M. Gonzalez**, CEG, **Ivar Staal**, PE, and **Joe Montagna**, PE, with offices in Burbank, Santa Ana, and **San Francisco,** with **Gonzales** managing the San Francisco office. They wereknown as“GTC.” Today they are a Caltrans/CUCP DBE, California DGS SBE, and San Francisco HRC (GSA/CMD) LBE minority-owned firm, predominately serving public agencies and utilities, etc. The Principal Engineer and President is **G. 'Neel' Neelakantan, PhD, GE (BSCE ‘86 IIT Madras; MS ’88 SUNY Buffalo; PhD ’91 Arizona), who joined the firm in 1991. Other senior staff include: James Thurber, CEG, CHG, Deron van Hoff, GE, Joseph Seibold, GE, Nick Ng, GE, Mark R. Petersen, GE, CEG (1989-95), and Dustin Agnew, PE. Vijith Thilakaratne** was a project engineer. They retained a branch office in Lake Forest in southern California managed by James Thurber (see Southern California threadline). The firm’s San Francisco office was located at 500 Sansome Street and managed by Dr. Neelakantan. In September 2019 GTC was acquired by ENGEO, Inc. of San Ramon, which continued operating both offices as part of their expanding operations.

**Geo-Engineering (1965-77)**

 Founded by **Oliver H. Gilbert, Jr.,** PE (1931-81) (BSCE ’53 MIT)around 1965and located at 1138 Howard Street in San Francisco (not connected with Geo-Engineering founded by Return F. Moore in 1955 in the Los Angeles area). In the late 1960s the firm’s Vice President was **Leonard O. Long**, PE (RCE 13465 in 1962). Long then managed Lowry & Associates’ Bay Area office in Alameda, before co-founding Berlogar, Long & Associates in 1973. By 1978 Gilbert was working for Woodward Clyde in Oakland and San Francisco. Gilbert was a native of the Philippines and a graduate of MIT. He lived in Berkeley and died at age 49 in July 1981, while working for Woodward Clyde.

**Hawke Engineers (early 1960s-1979)**

 Firm founded by **James P. Hawke,** PE (1910-79), registered in 1945 as RCE 6311. The firm was based in San Francisco. Hawke served in the Navy during World War II, then worked many years for the International Engineering Co. in San Francisco (profiled above), mostly on rockfill dams across the USA (publishing several articles in ASCE journals), and in a similar capacity for Kaiser Engineers out of Oakland in the early 1960s. Although Hawke was principally a civil-structural firm specializing in dam design, they also performed geotechnical work, ranging from real estate disclosures to geotechnical feasibility reports for Parsons-Tudor-Bechtel on the proposed BART system in the 1960s. Some of their consulting work included a report “*Post Sylmar earthquake analysis of safety of Devil's Gate Dam*,” prepared for Los Angeles County Flood Control District in 1975. Hawke died in April 1979.

**Favro Construction and Engineeering (1966-2018)**

 Geotechnical design-construction firm found by Oakland native **Peter L. Favro**, PE, GE (BSCE ’64 SJSU) (1942-2018) in December 1966 and based in Oakland, Castro Valley, and eventually, Moraga. Firm specialized in the design and construction of foundation repairs, drainage problems, retaining walls, and geotechnical reconnaissances of properties for real estate transactctions.

**Dunham & Associates (1972-2007)**

Founded in July 1972 by **David B. Dunham**, GE (BSCE 1960; Clarkson College of Technology) and originally based in San Mateo, then Palo Alto, San Carlos, and finally, in Belmont. Dunham had previous worked for the San Francisco District of the Army Corps of Engineers during the 1960s.

**Lawrence B. Karp, Consulting Geotechnical Engineer (1973-present); Geoplex (2012-present)**

 Founded by **Larry Karp**, GE (BSCE ’63, MS ’75, MEng ‘76, D.Eng.’80 Berkeley), son of Berkeley structural engineer **Nathan Karp**, SE (BSCE ’35 Caltech), who pioneered the lift slab construction technique in the early 1960s. Larry was unique in that he was cross-trained in architecture, civil, structural, geotechnical, coastal, and construction engineering. He has two master’s degrees and his D.Eng in construction engineering/management from Berkeley, working under Professors **Joe Johnson** (MS) and **Ben C. Gerwick, Jr.** (MEng and DEng). He engaged in considerable forensic work and designed a number of unique structural repairs for Bay Area clients and geotechnical firms, including: **Dick Meehan, Alan Kropp, Don Hillebrandt, Dave Rogers**, and several others. He was known for precise detailing and notes on his construction plans, esp for tiebacks and ground anchors. He also ;possessed an ability to dig up information nobody else could ever seem to find! He worked out his home at the top of El Toyonal Hill in Orinda.

**Earth Mechanics & Site Engineering (1970-85)**

 Founded by **Clarence McDonald**, PE and **Henry G. Thurm**, PE in Orinda around ~1970, and later moved to Lafayette. The firm was subsequently owned by Thurm, after he secured his PE registration in 1974. He was an early advocate and practitioner of ‘trenchless technology,’ using hydraulically-operated “hole-hogs.” Thurm died of natural causes in 1985, and the firm was dissolved.

**Zickefoose and Associates (1973-92)**

 Started by **Neil H. Zickefoose**, CEG (BS Geol ’56; MS Geotech ‘63 West Virginia) around 1973, based in Richmond, and later, in El Sobrante. Previous to starting his own consultancy, he worked for the USGS in Alaska, Shannon & Wilson in Seattle, D’Appolonia in Pittsburgh, Bechtel and Dames & Moore in San Francisco, and for Gribaldo, Jones & Associates in San Francisco. After closing down his firm, he worked as a hydrogeologist for Exceltech in Fremont, as Chief Hydrogeologist for American Environmental Management, ATEC Environmental Consultants in Sacramento, and, then, as Senior Geologist/Dept Manager for Law Engineering & Environmental, also in Sacramento.

**Western Geological Consultants (1975-2005)**

 Firm started by engineering geologist **Harry W. Short**, CEG (PhB Geol ’56, North Dakota) around 1975, based out of Concord, after he worked for the California Department of Water Resources. Upon retirement he moved to Rossmoor in Walnut Creek, where he continued consulting. The firm advertised itself as having expertise in geological engineering, exploration services, fault trenching, mining and associated services. In April 1970, Harry published an article in the Bulletin of the National Speleological Society describing his ongoing explorations of Moaning Cavern, in the Sierras. For many years he was also active in the Contra Costa Mineral and Gem Society.

**PSC Associates Inc. (1975 – 2018)**

PSC was founded by **Peter S-C. Chan**, PE, GE (1940-2018) (BSCE 1966 Cal Poly Pomona) in Mountain View and San Francisco. One of his earliest staff engineers was **Alex Buller**, PE. In the 1980s one of the senior engineers was **Y.D. (David) Wang** (PhD Berkeley). **Gaurang** (**Gary) R. Parikh**, PE also served as a senior geotechnical engineer for many years. **David Buckley**, PE, CEG (BA Geol ’75; MS ’77 Purdue) worked for the firm in 1987-89, and **Ed Medley**, PE, CEG (BS GeoE UBC ’79; PhD GeoE ’93 Berkeley) in 1989-92. In the 1990s **William C. Wood**, GE (BSCE ’61 Berkeley) of Dames & Moore joined as Principal Engineer of the San Francisco office.

**Geoconsultants, Inc. (1976-present)**

 Small hydrogeology firm founded by former Santa Clara County Geologist **Jeremy C. Wire**, CEG, CHG (BA Geol ’58 Pomona; MA ’61 UCLA), and based in San Jose. Wire came to the Bay Area from the Corps of Engineers Waterways Experiment Station in Vicksburg in 1966 to serve as the first Santa Clara County Geologist. He then served as chief geologist of Lowney-Kaldveer from 1969-71 and for Terrasearch of San Jose, from 1971-75. In 1976 **John K. Hofer**, CEG (BA Geol ’71 SJSU) began working for the firm part-time and now serves as the firm’s Vice President and Chief Hydrogeologist. **Keil A. Albert, PG (BS Geol ’95 CSU Sonoma) joined the firm in 1994, and currently serves as a senior geologist.**

**Bay Soils (1977-97)**

 Founded by **Curtis L. “Curt” Messinger**, CEG (1928-2004) (BA Geol ’52 Cornell; MS EngG ’58 Massachusetts) and based in Pleasanton for 30+ years. Messinger had previously served in the Marine Corps and after graduation from Cornell, joined the Air Force’s Civil Engineer Support Agency (8 years). He was an early member of AEG (joining in 1961, while working at Lowry AFB in Denver). He left the Air Force in 1966 and lived in Hayward for a few years before moving to Pleasanton, around 1969.

**Rogers Johnson & Associates (1977-present)**

 Engineering geology and hydrogeology firm founded by **Rogers E. Johnson**, CEG (BA Geol ’69 CSUSF) around 1977, originally in Santa Cruz, and later in Watsonville. Johnson completed a significant volume of graduate research on coastal retreat rates in central and northern California at UC Santa Cruz, between 1970-74, but never completed his doctoral dissertation. For many years he and Prof Leonard A. Palmer, RG at Portland State (PhD ‘67 UCLA) were considered the two leading experts on coastal retreat rates in California. **Greg Easton**, CEG (BS Geol ’99 UCSC) was the firm’s project geologist from 2001-12, before establishing Easton Geology in July 2012. **Alan O. Allwardt**, PG serves as a project geologist.

**Russell C. Greenlaw & Associates; Faast Software**

Founded by **Russ Greenlaw**, PE, ME (MSCE ’69 Berkeley) and located at 3062 East Avenue in Livermore. Russ had previously taught at the University of Pacific in Stockton (early 1970s) and had owned **GCN/Hydronet Services** of Stockton in the mid to late 1970s. He also worked with/for Lawrence Livermore National Lab, moving to Livermore in the early 1980s. In the 1990s he operated Faast Software out of the same office, in Livermore.

**Engeotech (1979-2008)**

Founded in 1979 and incorporated in July 1980 by **Muhammad Hussain**, GE and based in Milpitas from 1990 onward. The firm was dissolved in 2008, and Hussain moved to Merced.

**Seidelman Associates (1980-96)**

 Seidelman Associates was founded by **Paul J. Seidelman** GE, CEG (1946-2013) (BS Geol ’73; MS ’75 SJSU) in 1980, initially based in Lafayette, then Pleasant Hill. Seidelman gained experience dealing with landslide mitigation working with the US Forest Service from 1975-80, where he served as regional supervising geologist for California. **Jeff Borum**, CEG (BS Geol ’79 UCSC; MS ’81 SJSU) and **Mitch Wolfe**, CEG (profiled in Cal Engineering & Geology) were senior associates in the 1980s, and **Bob Anderson** was a staff geologist. Borum and Wolfe had previously worked for the US Forest Service in northern California. Seidelman grew up in San Mateo, attended San Mateo College, served in the Navy at Treasure Island during the Vietnam War, then completed his studies at San Jose State in engineering geology. After closing down his firm in the mid-1990s, he moved to Green Valley (1994), and later, back to the Orinda area. He continued doing consulting and expert witness work, while maintaining a general engineering contracting firm, **Foundations and Earth Retaining Systems**. Seidelman passed away in January 2013.

**Allstate Geotechnical Services (1983-91); AGS, Inc. (1991-present)** AGS was founded in Nov 1983 as Allstate Geotechnical Services by **Robert T. “Bob” Wong**, GE (PhD GeotE ’71 Berkeley) as a minority-owned business enterprise (MBE). The firm was renamed AGI, Inc. in 1991 and has been co-certified as a San Francisco Local Business Enterprise (LBE). Robert Wong had previously served as Assistant Chief Geotechnical Engineer at Kaiser Engineers in Oakland, Assistant Professor at West Virginia Institute of Technology, and Vice President at GTC and Cooper Clark Associates. They provide services in geotechnical, environmental, civil, structural, and construction engineering and inspection, and laboratory testing. The firm is based in San Francisco with branch offices, providing a range of services to public agencies and private clients. **Dennis Wong**, PE (BSCE Brown; MS Stanford) succeeded his father as the firm’s president for five years, and remains nominally in charge of the firm’s operations (he spun off the firm’s civil/architectural/structural group as Aetipic, which shares the same office).

 The firm’s current president is **Bahram Khamenehpour**, GE (PhD GeotE’83 Berkeley) previously worked for Dames & Moore and Woodward Clyde in Southern California before joining AGS. Senior staff include **Kamran Ghiassi**, GE (PhD GeotE Illinois), who previously worked for Olivia Chen, Rutherford & Chekene, and Terrasearch; **Keyvan Fotoohi**, PhD, GE, **Anthony Argyriou**, GE, **James Tsao**, SE, **Kenneth J. Litle**, PE, and **Sami Malaeb**, PE. In 2015 **Michelle Shriro**, GE (BSCE ’97;MS ’99; PhD 2014 Berkeley) joined the firm.

**Questa Engineering Corp. (1983-present)**

 Geoenvironmental firm founded in 1983 by **Norman H. Hantzsche**, PE (BSCE ’71 Stanford; MS ’73 UC Davis) in Point Richmond**.** Prior to forming Questa in 1983, he served with RAMLIT associates in Berkeley and on the staffs of the North Coast Regional Water Quality Control Board and the State Water Resources Control Board. **Jeffrey H. Peters**, REA hydrologist/soil scientist (MS Soil Sci ’73 UC Davis), **Sydney A. Temple**, PE (BS Geol ’86 UCSC) senior hydrologist, **Willard N. Hopkins**, CEG senior engineering geologist, **Gary E. Underdahl**, GE associate geotechnical engineer, **Carl H. Nelson**, PE water resources engineer, and **Paul S. Popisil**, RG, project geologist.

**Brunsing Associates Consulting Engineers/BACE Geotechnical (1985-92); Brunsing Associates, Inc. (1992 – present)**

 Founded in 1985 by **Thomas P. Brunsing,** PE (BSCE ’74, MS ’76, PhD ’80 Berkeley) in Marin County. Main office later moved to Santa Rosa, with branch offices elsewhere in the North Coast region. The firms were consolidated in October 1992 as **Brunsing Associates, Inc**., or **BAI.** They specialize in geoenvironmental work, as well as general geotechnical consultations. Senior staff has included **Erik E. Olsborg**, CEG, **J. Erich Rauber, PE, Gary F. Sitton**, GE, **Keith Colorado, GE, David E. Conley, PG, William H. H. Coset, and Patrick Lamb.**

**Vonder Haar Hydrogeology Associates (1986-present)**

Founded by **Stephen Vonder Haar,** CHG (BS Geol ’71 Illinois; PhD ‘76 USC) in 1986, after he worked for Pacific Energy Consultants and the Earth Sciences Division of Lawrence Berkeley National Laboratory. His firm specializes in forensic consultations in hydrogeology and is based in Berkeley.

**Weber, Hayes and Associates (1988-96); Gerry E. Weber Geologic Consultant (1996-2009)**

 After working for the USGS (1971-73), Cordilleran Exploration (1981-84), and Rogers Johnson (1984-87), **Gerry Weber**, CEG (BA Geol ’62 UC Riverside; MS ’68 Texas-Austin; PhD ’80 UC Santa Cruz) and **Joseph P. Hayes**, CEG, CHG (from Rogers Johnson and EMCON) founded Weber-Hayes in January 1988, based in Watsonville. The firm specialized in engineering geology and hydrogeology consultations in the Monterey-Santa Cruz area. **Jeff M. Nolan**, CEG was one of their senior geologists in the 1990s. **Craig Drizin**, PE is senior engineer and **Patrick Hoban** senior geologist with the firm, since 1991.

Weber also served as an adjunct professor of geology at UC Santa Cruz, where he taught field geology, between 1979-2001. Weber also performed funded research work on the age and evolution of elevated marine terraces in coastal California, and on seismically-induced landslides in the Santa Cruz Mtns., following the 1989 Loma Prieta quake. Weber provided expert witness services for the City of Santa Cruz, Santa Cruz County, and Monterey County. He began practicing in the Santa Cruz-Monterey area in 1973 and slowed down considerably after 2003, though still active as a peer reviewer and consultant to other firms (e.g. Cotton-Shires and William Lettis & Associates) and governmental agencies.

**John A. Becker & Associates (1990-2007)**

 Founded by **John de Becker**, GE (1914-2007) (BSE ’37 Univ Vienna) in 1990. After graduation from the University of Vienna he served as an officer in the Austrian Army. Fearing induction into the Nazi Wehrmacht on the eve of World War II, he sought asylum in England in 1939, where he met his wife and married in 1943. In the mid-1950s they immigrated to Canada and then to Washington, DC, before settling in Mill Valley in 1957. Becker took a position with Abbot A. Hanks Laboratories in San Francisco, where he learned about soil mechanics and soil testing working with **Leonard O. Long**. He became registered PE in 1959 and a GE in 1987. In 1969 he joined the US Navy’s Western Division, Naval Facilities Engineering Command (WESTDIV-NAVFAC) in San Bruno, as a civilian engineer working under **Joseph D. Boitano**, Head of the Soil Mechanics Branch. Becker and his family moved to San Francisco that same year. He did piecework consulting from his home, and upon retirement from the Navy in 1990 he started **John A. Becker & Associates**, working out of San Francisco.

**Robert Y. Chew Geotechnical (1990-present)**

 Founded by **Robert Y.C. Chew**, GE with offices in San Francisco and Hayward. Operating as an MBE and SBE firm since its establishment in August 1990. They often serve as MBE, and/or SFO LBE or SBE subcontractors, with full-service firms peforming infrastructure design work for public agencies, such as the EBMUD, San Francisco DPW and PUC, etc. From 1994-2001 **Mark McKee**, GE (BSGE 1988 Arizona) was a project engineer with the firm. The firm is a member of the Bay Area Earthquake Alliance.

**Olivia Chen Consultants (1991-2006)**

 A WBE geotechnical firm started by **Olivia Chen**, PE (MS EnvEng ‘66 Stanford) in November 1991, after working for Metcalf & Eddy (1966-89). Hers was the ***first woman-owned geotechnical consulting firm (WBE) in the San Francisco Bay Area***. The company was based in downtown San Francisco until purchased by **AECOM Water,** in November 2006. Chen became a Senior VP at AECOM Water, then departed in late 2009 to start her own nonprofit firm.

**Fowler & Associates (1990s-2000s)**

 Founded by **Donald R. Fowler**, CEG in San Francisco, years unknown. Offered geological and geotechnical engineering services in 1990s thru middle 2000s, and active in AEG. Fowler retired and moved to Tucson by 2010.

**Parikh Consultants, Inc**. **(1994-present)**

After working for PSC Associates, **Gaurang** ‘**Gary’ R. Parikh**, GE (MSCE ’71 Berkeley) started Parikh Consultants, Inc. in Milpitas in the early 1990s and took **Y. David Wang,** PhD, PE (PhD Civ Eng Berkeley) with him as his Vice President.

**Foundation Engineering Consultants, Inc. (2008-present)**

FEC, Inc. was founded in October 2008 as a geotechnical engineering firm in Fremont, CA by **Liiban A. Affi**, P.E. Initially the firm was doing micropile design and shoring for design-build firms. Affi moved from the Midwest in 2005 and initially worked in Irvine. In 2010 the firm was incorporated and expanded its services into Asia. Currently the firm focuses on geotechnical reports and excavation shoring design and retaining structures in CA.

**Calgeotech Engineering Consultants (2010-present)**

 Founded in July 2010 by **Manny Saleminik**, GE (MSCE 1994 SJSU) and **Apostolos Kozompolis**, GE (BSCE 1995 Tech Univ Athens; MEng 1998 Berkeley) and based in San Ramon. Before founding the firm, Saleminik worked for Parsons Brinkerhoff, while Kozompolis previously worked for Engeo. They are an MBE firm and maintain a building contractor’s license to perform foundation construction and repairs. In 2013 **Alex Wong**, PE (BSCE ’84; MS ’86 Utah State) joined the firm as a project engineer.

**Early Consulting Engineering Geologists (1930s-60s)**

**The Marliaves - consulting engineering geologists (1938 - 90)**

 **Chester Marliave** and his two sons, **Elmer Marliave** and **Burton Marliave**, were engineering geologists who specialized in water-related structures including dam sites, aqueducts, pumping plants, and tunnels. One or more of the three Marliaves worked on engineering geology studies directed to practically every major water development project in California during the period from the mid-1920s through the late 1970s – projects which enabled the rapid economic growth of the state and which changed the appearance of the landscape over large areas. Much of their work was done for the East Bay Municipal Utility District in Oakland, but other agencies as well, such as the Santa Clara Valley Water District.

 **Chester Marliave**, PE, CPG (1885 – 1958) was born in May 1885 in San Francisco. He studied mining engineering and geology at Berkeley, graduating in 1907. After working at the Empire Mine in Grass Valley, he turned his attention to water resources projects, where he spent the remainder of his career. As both a geologist and a registered civil engineer, he focused much of his attention on hydrology studies, which were the lifeblood of California agriculture and development. These activities included the siting and design of dam foundations and appurtenant structures, tunnels, and assessing suitable aggregates, construction materials, etc. At various times he worked on the Hetch Hetchy distribution system of the Spring Valley Water Co. of San Francisco (1916-19), and on assessing the groundwater resources of the Ygnacio Valley near Walnut Creek (1919-20). He then worked for the California Division of Water Resources, followed by the East Bay Water Co. (1923-25), returning to the Division of Water Resources as their new Chief Geologist, in which he continued until his retirement from State service in late 1938.

 Following the catastrophic failure of the St. Francis Dam in March 1928, the State of California enacted the most rigorous program of dam safety in the world. Chester was assigned as to work with civil engineer George Hawley to make a preliminary assessment of the potential instability of all the dams in the state. These investigations extended from 1929-35.

 He established a consultancy based in Berkeley, worked chiefly water resources projects in California and other western states. During the Second World War he served as a consultant to the Navy Seabees and the Army Corps of Engineers. In 1952 he began working on international projects, as far away as Brazil. He continued working shortly before his death at age 72 on March 22, 1958.

 **Elmer C. Marliave**, CPG (1910 – 1967) received his academic training at Berkeley (BA Geol ’32) and took a position with the State Water Resources Board in Sacramento, becoming the Chief Geologist in 1939 after his father had retired the previous year. He spent three years as an Army artillery officer in Panama during the Second World War before returning to Sacramento. The WRB became the Department of Water Resources in 1952 and Elmer retired in 1956. He was also a member of the committee of thirteen which founded the California Association of Engineering Geologists in 1957, which became AEG in January 1963. He maintained an active consultancy based out of Sacramento up until his death, on Sept. 24, 1967.

 **Burton H. Marliave**, CEG (1917 – 1991) was born in Berkeley and received his BS with a dual major in mining engineering and geology from Berkeley in 1939. He took a position with the USGS in California and then with the Bureau of Mines in Utah. An Army Reserve officer, he was recalled to active duty during the Second World War and served in North Africa and Italy. In the fall of 1945 he joined PG&E as an engineering geologist, working on their Feather River hydroelectric projects. In 1949 he joined his father Chester’s consultancy, working on water resources projects as well as groundwater and slope stability problems. After his father's death in March, 1958, Burt continued as a consultant in engineering geology, working out of his home in Walnut Creek. His clients included the East Bay Municipal Utility District and numerous private firms. Supplementing his major water-related studies, he also performed geotechnical studies for the various campuses of the University of California, including Berkeley, Santa Cruz, and San Francisco. During the 1980s he became an arbitrator for the American Arbitration Association. He was active in the California Association of Engineering Geologists and served as the first president of the Association of Engineering Geologists, when it was renamed on January 1, 1963. He continued working up until the time of his death at age 73 on February 4, 1991.

**Ray C. Treasher**, CPG (1898-1967) was born in Chicago, but grew up in Sunnyside (Yakima), Washington. He served as an enlisted soldier in the First World War. After the war he was educated at Washington State, receiving his BS (1924) and MS (1925) degrees in geology (his thesis was the geology of the Pullman [Washington] Quadrangle). He then attended Oregon State as a teaching fellow for one year to work on his PhD, but decided to teach high school in Longview, Washington. In 1936 he accepted an appointment as Economic Geologist on the staff of Oregon State Planning Board, where he compiled a comprehensive bibliography of the geology and mineral resources of Oregon. The following year (1937) he became the first geologist appointed to the newly formed Oregon Department of Geology & Mineral Industries in Portland.

 In December 1943 Ray moved to the Sacramento District of the Corps of Engineers, becoming Assistant Chief of the Geology Section under **Claire P. Holdridge**. He served as the project geologist for the Folsom Dam project between 1949-53, where he supervised some impressive mapping of the dam’s foundation excavations, which proved valuable 60 years later, when the dam’s foundation stability underwent a thorough reassessment. In 1953 he became Chief Geologist of the Corps San Francisco District, where he focused his energies on the Coyote Dam/Lake Mendocino project near Ukiah and complied a “***Comprehensive Survey Report on San Francisco Bay***,” which became one of the most oft-cited geotechnical documents of that era, which influenced planning of the BART system and assessment of geotechnical site response to earthquake shaking along the bay margins.

 Ray was a charter member of the California Association of Engineering Geologists when it formed in 1957 and was the second person to be named an Honorary Member of AEG, in 1965. He retired from the Corps in 1861 and served as a consultant on dimension stone, of which his expertise was widely known and respected. He also lectured in the geological engineering program at U.C. Berkeley. He died at his home in Duncan Mills, California on June 25, 1967.

**Thomas F. Thompson**, CEG (1906-76) received his BA in Geology from Stanford in 1931. He was a consulting engineering geologist throughout the 1960s and 70s working out of an office in San Francisco (between 1956-62), and later, from his home in Burlingame (1962-76), mostly consulting on dams. He previously worked for the Army Corps of Engineers, serving as Chief of the Geology Section working on the proposed Panama Canal expansion in the late 1940s. After retiring from the Corps, he worked for Ralph M. Parsons as a resident engineer on Bakhra Dam in India during the mid-1950s. He lectured in geological engineering at U.C. Berkeley in 1961-62, after Parker Trask died. Throughout the 1960s and into the early 1970s he did a lot of consulting work on various dams and water supply projects in Africa for Kaiser Engineers, and served as a consultant to the Metropolitan Water District and the U.S. Atomic Energy Commission (during the Operation Plowshare “pan-atomic canal studies” of the late 1960s).

**William I. Gardner**, PhD, CEG(1903-91) received his BS in mining engineering from U.C. Berkeley in 1927, and PhD in geology from the University of Minnesota in 1937 (*Structural study of the Merrimac Batholith, Sierra Nevada, California*). After several years working for mining and oil companies he joined the US Bureau of Reclamation in 1936, and remained with that agency for 33 years, rising thru the ranks: Regional Geologist at Sacramento in 1942 (overseeing the geologic aspects of Reclamation’s Central Valley Project, which included detailed mapping of the foundations of Shasta and Friant Dams, mapped at a scale of 1 inch = 20 ft); and Chief Geologist of Reclamation’s Division of Geology, from 1963-69. Along the way he was one of 13 founding members of AEG in 1957, and served as the association’s third president in 1959. He was elected an Honorary Fellow in 1974. He retired from the Bureau of Reclamation in 1969 and moved to Moraga, CA. From his residence he continued consulting on a wide array of dams and water resources projects world-wide, until his death in July 1991.

**John A. Trantina**, CEG (1904-90) was a native of Missouri, who found employment with the US Army Corps of Engineers as a civilian engineering technician in the 1920s, working on navigation projects in the Missouri River Basin. In 1932 he enrolled in the geology program at the South Dakota School of Mines & Technology, completing his bachelor’s degree in 1938, followed by a master’s in geology from the Missouri School of Mines in 1939. He returned to the Army Corps of Engineers, and worked on the Oahe, Garrison, and Fort Randall embankment dams constructed along the Missouri River in the 1940s and 50s. He became Chief Geologist of the Corps Omaha District by the time he retired, in 1956. He then joined Woodward-Clyde-Sherrard Associates in Oakland as Executive Vice President and Chief Geologist, engaged primarily with embankment dam design and construction. He served as Chief Consulting Geologist until retiring altogether from Woodward Clyde, around 1980. He then worked as a consulting geologist out of his home in El Cerrito on a host of projects, mostly dams. He was known widely for his work on the properties of clay shales, in particular, frost action and rebound triggered by sudden unloading and stress relief.

**Frank A. Nickell**, PhD, PE, CEG (1906-75) was born in Beatrice, Nebraska in March 1906 and grew up in Los Angeles. He earned all of his degrees in geology and civil engineering at Caltech. He completed his BS in geology in 1927, M.S. in 1928, and Ph.D. in geology and civil engineering in 1931. During graduate school he was a teaching assistant in languages and physical education (along with his roommate Layton Stanton). His Ph.D. dissertation was on the *Geology of the Soledad Quadrangle, Central California*. He was the ***first geologist hired by the U.S. Bureau of Reclamation*** (in the fall of 1931) to map the rock exposures at Hoover Dam, which began construction that year. Nickell had already been assisting Caltech Prof. Leslie Ransome with his mapping of the geology at the dam.

 After the foundation preparation and tunneling work on Hoover Dam was completed in 1933, Nickell continued working on other BurRec dams, including Parker, Grand Coulee, Shasta, and Friant Dams. In 1939 he was named Chief Geologist of the Bureau of Reclamation. In 1942 he began his own consultancy based out of Whittier. Nickell accepted positions with Shell Oil Company and Standard Oil and Gas as a petroleum geologist in 1943-44, but this work took him overseas. From 1945 until 1973 he was a consulting geologist on dams, hydroelectric development, irrigation, and geologic studies for companies and governments worldwide. In the early 1950s he moved to San Mateo, where he remained until he retired and moved to La Jolla, where he died in September 1975. He consulted on dam projects all over the world the remainder of his life, including the Taum Sauk Upper Reservoir pumped storage project for Union Electric Co. of St. Louis (completed in 1960-64), which failed in December 2005. His professional files are archived at the American Heritage Center Library at the University of Wyoming.

**Clark E. McHuron**, CEG (1919-2017) was a native of North Syracuse, NY. He attened Syracuse University and completed his BA in geology in 1940. He then undertook graduate studies at Brown University before accepting a position with the Army Map Service in Wash, DC, just after WW2 began. He later accepted a commission in the Navy, serving as a LTJG aboard the Fargo-Class cruiser USS Huntington in 1944-45. After the war he found employment with the Bureau of Reclamation in Denver. He worked as a resident geologist on Boysen Dam in Wyoming, then as District Geologist in Palmer, Alaska. In 1953 the family moved to Belmont on the San Francisco Peninsula and Clark became one of the early consulting geologists in the Bay Area. Some of his consultations included an evaluation of the Stanford Linear Accelerator site in the late 1950s for the Utah Construction Co. He also did a lot of work for PG&E on a number of their sites, including the nuclear power plant at Bodega Bay, astride a strand of the San Andreas Fault. Around 1970 he moved to Santa Rosa, and consulted on a number of tunnel projects. He then moved to Oakmont, CA, before moving to Port Ludlow, WA in 1993. In 2004 he and his wife Jean returned to California, settling in Davis. Their son **Eric J. McHuron**, PhD, CEG also became an engineering geologist, working for Dames & Moore and Foott & Associates, before starting McHuron Geosciences in 1993, based out of San Francisco. Clark died in Yountville on May 1, 2017.

**Alvin L. Franks**, Ph.D., CEG, CHG (1924- ) was a native of the Akron, Ohio area. During the Second World War he led clandestine forays behind enemy lines to tap German military phone lines. During the Battle of the Bulge he was trapped for an extended period, suffering from severe frostbite of his feet and toes and pneumonia in the right lung, which took 6 weeks to clean up. Al was given a 45% disability from the Army for frostbite damage to his feet and the spent much of 1945 and early '46 in Army and VA hospitals, undergoing treatment to curtail recurring infections in his damaged feet and pneumonia in the right lung, which came back every 8 to 12 years. The VA doctors recommended that he find a warmer climate for his feet, which were becoming re-infected after prolonged exposure to cold, during the winters, and he could not walk for any extended distance.

In the summer of 1946 he drove to Los Angeles, and enrolled at East Los Angeles Junior College for one semester. In January 1946 he transferred to UCLA to major in geology, and attended geology field camp in Baja California in the summer of 1947. Al received his BS degree in geology from UCLA in August 1950, after completing his third summer field camp! In 1951 he enrolled in graduate studies at UCLA, while working for Shell Oil.

 In 1952 he joined the State Division of Highways Materials and Research Lab, as their only geologist outside of the Bridge Department. He then moved to field exploration, where he worked under **Travis W. Smith**, PE out of the Transportation Laboratory in Sacramento from 1953-58. This work included the engineering geology for many elements of the proposed new interstate highway system, including assessments of slope stability, foundations, and predictions of ground settlement under embankments and bridge approaches, etc. The most challenging project was the massive fill placed across Candlestick Cove to convey US Hwy 101 between Candlestick and Sierra Points, just north of the San Francisco Airport. The fill displaced 5 to 10 feet of  soft mud laterally, and required ongoing monitoring as each increment of fill was placed, eventually allowing 2.4-mile long section of the Bayshore Freeway to be completed.

                In the 1950s most areas of the state employed incinerators and burning dumps, prior to the advent of the sanitary landfills. In 1958 Al transferred to the Water Rights Board and was instrumental in doing all of the Geology section of the 1969 Porter-Cologne Water Quality Control Act. The Water Rights Board was given more power and renamed the **California State Water Resources Control Board** (SWRCB), based in Sacramento. This became the regulatory agency that oversaw the state’s water quality, and reviewed applications for solid waste disposal, with Franks serving as they agency’s senior hydrogeology expert. This eventually led to Al becoming the State of California's senior technical expert on solid waste landfills and adjudication of water rights, including groundwater in court actions, while serving as Supervising Engineering Geologist of the WRCB, from 1963-80. While in that capacity he co-wrote Subchapter 15 [Waste Discharge Requirements] of Title 23 of the California Administrative Code (originally adopted in March 1972), which regulates groundwater and surface water quality around solid waste landfills. At the time these were the most restrictive geoenvironmental regulations for solid waste landfills in the United States. In his capacity as the author of these new regulations Franks received a great deal of pressure from landfill operators, who were wary of the new requirements.

Al also wrote a number of articles and regulations that were pivotal in establishing better standards for groundwater quality. In the September 1972 issue of *California Geology* Al penned one of the most oft-cited articles on sewage disposal systems in California, titled “***Geology for individual sewer disposal systems.***” In July 1980 he wrote “***Waste Discharge Requirements for Nonsewerable Waste Disposal to Land***” for the SWRCB, which became an oft-cited standard in the solid waste industry, nation-wide.

                Between 1974-80 Al completed doctoral studies at U.C. Davis, where he also completed 75 units of civil engineering and soil science courses, working with Professors Krohn and Bigger. He completed his PhD in 1980 with his dissertation topic “***Environmental geology-land use planning, erosion and sedimentation of the west Martis Creek drainage basin, California”*** (near Truckee). During the 60s and 70s he also taught evening courses at USC and at UC Davis.

After retiring from state service in 1980, he opened a consulting business, **A. L. Franks Engineering/ Geologist** as a DVBE firm, which specialized in solid waste geoenvironmental engineering and hydrogeology, based at 44 Lakeshore Circle in Sacramento. His expertise was sought by just about every landfill applicant in the state during the 1980s and 90s. He was also hired by the National Park Service to develop a groundwater supply system for use in Yosemite Valley. Using the latest geophysical system at that time he had a well drilled into an ancient streambed system beneath 400 feet of gravel and sand, and developed a well with a capacity of 1,200 gpm. They required 800 gpm, so the extra water was pumped to other parts of the park.

                When Al served as the senior geologist of the SWRCB, the Regional Water Quality Control Boards didn't require technical proficiency testing similar to that required by the State Division of Mines & Geology. Franks fought for proficiency testing of geologists, but lost that battle. He continued lobbying for a separate certification in hydrogeology, which eventually met with success in 1995, without allowance for grandfathering (***every applicant was required to take and pass the proficiency test***, for the first time in California history). His colleagues honored him by designating him as Hydrogeologist (HG) #1.

**Geophysical Consultants**

**Allied Geophysics (early 1940s – late 1970s)**

 Operated by **R. Burton Rose**, CEG, RGP (1910-90), who grew up in San Jose and received his graduate education at UCLA in the late 1930s (MS Geol 1939 UCLA). He was writing articles on geophysical exploration as early as 1941 (see ***Radioactive Exploration***, in *The Mines Magazine*, Vol. 31, No. 12, p. 617-620, 635, Dec 1941). He operated a consulting firm known as Allied Geophysics out of San Jose from about 1940 through the late 1970s. Rose performed seismic refraction surveys for numerous public agencies, engineering firms, and private clients, many associated with groundwater studies.

**EG& G Geometrics (1976-94); Geometrics (1994-present)**

EG&G’s origins date back to 1931 when [MIT](http://en.wikipedia.org/wiki/Massachusetts_Institute_of_Technology) Professor [**Harold E. “Doc” Edgerton**](http://en.wikipedia.org/wiki/Harold_Edgerton)(1903-90)formed a partnership with his graduate student [**Kenneth Germeshausen**](http://en.wikipedia.org/wiki/Kenneth_Germeshausen). Edgerton was a pioneer in developing [high speed photography](http://en.wikipedia.org/wiki/High_speed_photography). In 1934 they were joined by another MIT grad student named [**Herbert Grier**](http://en.wikipedia.org/w/index.php?title=Herbert_Grier&action=edit&redlink=1). They became a prominent defense contractor during the Second World War and gained considerable fame for their work in high speed imaging of attempts to prepare a perfect implosion device as part of the ultra-secret Manhattan Project during the war. **Bernard "Barney" O'Keefe** became the fourth partner of the firm, which was reformulated as [**Edgerton**](http://en.wikipedia.org/wiki/Harold_Edgerton)**,** [**Germeshausen**](http://en.wikipedia.org/wiki/Kenneth_Germeshausen)**, and** [**Grier**](http://en.wikipedia.org/w/index.php?title=Herbert_Grier&action=edit&redlink=1)**, Inc**., or EG&G, in 1947.

During the 1950s and 1960s the firm did a lot of work for the Atomic Energy Commission, working with Lawrence Livermore National Lab, [Raytheon](http://en.wikipedia.org/wiki/Raytheon), Reynolds Electrical and Engineering, and others. EG&G expanded its services to include facilities management, technical services, security, and pilot training for the Department of Defense. EG&G also developed a variety of sensing, detection and night visioning products designed to detect radioactive, chemical, and biological agents, and a variety of acoustic sensors. The company also provided microwave and electronic components to the Department of Defense for electronic warfare and mine countermeasures.

 During the 1970s and 80s EG&G diversified by acquiring interest in firms involved in paper making, scientific instrumentation for marine, environmental and geophysical users, [automotive testing](http://en.wikipedia.org/wiki/EG%26G), fans and blowers, frequency control devices and other components. In the late 1980s and early 1990s most of these divisions were sold. Although EG&G was based in [Wellesley, Massachusetts](http://en.wikipedia.org/wiki/Wellesley%2C_Massachusetts), they established a Bay Area office in 1976 when they purchased Geometrics, founded in 1969 by **Sheldon Breiner**, RG, RGP (BS Physics ’59; MS Geophy’62; PhD ‘67 Stanford) in Palo Alto. The other Geometrics scientists were **Wiliam Jacobson, Tony McBride, Doug** **O’Brien, Alan Edberg**, and **Robert Prindle**, RG, RGP (all except Jacobson had previously worked for Varian Associates). Breiner left the firm in 1983, and their marketing rep was **Gerald B. ‘Geb’ Church** (BS ’76 Biology Stanford; MBA Laverne). Around 1994 the firm’s President **Steve W. Duckett** (BS Physics ’59 Brown; PhD ’64 Cornell) led a management buy-out of EG&G, and the firm once again became Geometrics. In 1997 they were purchased by Oyo Corporation of Tokyo, famous for their downhole suspension loggers. Geometrics remains a division of Oyo, headquartered in San Jose.

 In May 1999, the non-government side of EG&G purchased the Analytical Instruments Division of [PerkinElmer](http://en.wikipedia.org/wiki/PerkinElmer) and the remainder by the Carlyle Group. In 2001 Carlyle was purchased by URS Corporation of Gaithersburg, MD. In December 2009 the EG&G Division of URS became URS Federal Services.

**Gasch & Associates (1970-present)**

 **Gasch & Associates-Engineering Geophysics** was founded by **Jerrie W. Gasch**, CEG, PGP (1931- ) (BS Geol ’60 Wisconsin) in Jan 1970, after having worked for CA DWR and CDMG in Sacramento. They were the first engineering geophysics firm to be established in the Sacramento area, based out of Rancho Cordova. Gasch subsequently entered the gold mining business, but the firm continues to operate under the leadership of his son **Kent L. Gasch**, PGP (Geol CSU Chico) and senior consultants **David T. Hagin**, CEG, CHG, PGP (BS Geophy 1998 UCR) and **John W. Busby**, CEG, PGP (BA Geol Regents Col NY).

**Geonomics (1975-80)**

 Geonomics was a Berkeley-based geophysical consulting firm made up primarily of scientists from Lawrence Berkeley Laboratory (LBL) that did quite a bit of interesting work in the 1970s, mostly for oil companies and the US Department of Energy, examining geothermal potential. Some of their senior associates included Vice President Subit K. Sanyl, Allen M. Katzenstein, Tsvi Meidav, PhD and his wife Mae Z. Meidav, PhD. Others who authored reports for Geonomics included L. H. Goldsmith, M. Stark, Norman E. Goldstein, H. Wollenberg, B. Strisower, H. Hege, and M. Wilt. **Richard Weiss** worked for them briefly, in 1976-77. In 1980 Subit Sanyl (PhD ’71 Pet Eng’g, Stanford) started a firm named **GeothermEx, Inc**., based in Richmond

**Norcal Geophysical Consultants (1983-2016)**

Founded in 1983 by **Kenneth Blom,** PG, PGP, a former marine geologist for the USGS (1969-73), and Manager of Geophysical Operations for Harding Lawson (1973-83). Ken has a BS in geology from Fresno State in 1969 and graduate studies in geophysics at San Jose State. The firm maintained offices in Sacramento, moved to Petaluma, and then to Cotati (with a branch office in Fountain Valley). **Kenneth Blom** was still President in 2000. In 1994 Norcal expanded its capabilities to include borehole logging and imaging instrumentation and brought **Bill Henrich**, CEG, PGP (BA Econ ’76 LaSalle; MS Geol ’79 Idaho State) from Harding Lawson to manage this new department. Other principals include VP **Bill Black**, PGP (BA Geophy ’69; MS ’72 UC Riverside), who also served as President of the State Board of Geology & Geophysics from 2002-09; **Don Kirker**, PGP (BS Geol ’86 SDSU), **David Bissiri**, PGP (BS Geophys UCLA), **David T. Hagin**, CEG, PGP (BS Physics ’84 UC Irvine; MS Geophys ’86 UC Riverside), and **Anna Brody Haynie** (BA Geol Univ Rochester; MS Geol 2011 CSU Fresno). In 2016 Norcal was acquired by **Terracon, Inc**. which will continue operating the Sonoma County office with 11 employees. This will give Terracon a SF Bay Area presence.

**Redpath Geophysics/Qest Consultants/Geometrics (1985-present)**

 Founded around 1985 by **Bruce B. Redpath,** RGP in Galt, and later, Murphys, CA, after he had worked for Lawrence Livermore National Labs (LLNL) and URS/John Blume & Associates. At LLNL he worked on refining the seismic refraction technique for geoengineering applications (see ***Seismic Refraction Exploration for Engineering Site Investigations***, Tech Rpt E73-4, USACE-WES Explosive Excavation Research Lab, Livermore, May 1973). In the late 1970s-early 80s he performed pioneering work on downhole seismic arrays, including a 58 m deep hole in the midst of the downhole array at Berkeley’s Richmond Field Station (see Redpath, B. B., Edwards, R. B., Hale, R. J., and Kintler, F. C., 1982, ***Development of field techniques to measure damping values for near-surface rocks and soils***: NSF grant PFR-7900192; and Redpath, B. B., and Lee, R. C., 1986, In-situ measurements of shear-wave attenuation at a strong-motion recording site: USGS Contract No. 14-08-001-21823, prepared by URS-John A. Blume and Associates, San Francisco). Redpath had previously worked for GeoRecon in the Seattle area in the 1960s. He did pioneering work in downhole measurement of shear wave velocities, of particular import following the 1989 Loma Prieta Earthquake for Caltrans.

**Bay Area City and County Geologists**

The first “Town Geologist” in the Bay Area was Stanford Geology Professor **Arvid Johnson**, CEG who prepared an engineering geologic map of Portola Valley in 1969 and accepted the sobriquet “**Portola Valley Town Geologist**.” The hills west of Palo Alto are traversed by the San Andreas fault, mantled with all manner of shallow and deep-seated landslides, and the Butano Shale had caused all sorts of differential heave problems. Johnson was succeeded by **Bill Cotton** in early 1979, after Johnson left Stanford for the University of Cincinnati. Cotton updated Johnson’s geologic map of the city in the 1980s.

 The **City of Woodside** has also retained a consulting geologist to serve as their reviewing geologist for building permit applications. This position was originally held by Hayward State Geology Professor **Jon C. Cummings**, CEG (1971-75), then by **Dick Harding** of Earth Science Associates. Harding was succeeded by **Bill Cotton**, and later, by **Robert H. “Bob” Wright**. For many years **Earth Science Associates** performed similar geotechnical peer review services for a number of peninsula cities, including San Carlos.

 **William Cotton & Associates** provided engineering geologic and geotechnical peer review for a number of municipalities from the 1970s through the 2000s, including: **Portola Valley, Los Gatos, Saratoga, Milpitas, Fremont, Morgan Hill**, etc. Cotton has continued serving as the Town Geologist for Portola Valley since 1986.

**F. Beach Leighton** served as the first ad hoc county geologist for **San Mateo County**, after his firm studied the landslide and coastal retreat problems in Seal Cove, on the coast a few miles north of Half Moon Bay. This report was completed in October 1971and Leighton provided peer review of geotechnical reports associated with building permits in Seal Cove until 1975, when San Mateo County hired **Albert C. Neufeld**, CEG as their full-time County Planning Geologist (John C. Tinsley’s MS thesis at Stanford, titled “*Sea cliff erosion as a measure of coastal degredation, San Mateo County, California”* assessed many of the same issues).

 In 1966 the **Santa Clara County** **Water District** established a geologist position, which was filled by **Jeremy C. Wire**, CEG (BA Geol ’58 Pomona; MA ’61 UCLA), who came from the Corps of Engineers in Vicksburg. He remained in this position until 1969. In the 1970s Santa Clara County was reorganized to include an Environmental Resources Agency, and the County Geologist position was designated by the County’s Planning Director. For several decades that individual was **James O. Berkland**, CEG (BA Geol ’58 Berkeley), assisted by **Pete Anderson**, CEG (in the late 1970s). Berkland incurred the ire of his supervisors and was suspended several times because of his passion for predicting earthquakes using non-traditional means, which often appeared in Bay Area newspapers and were critiqued by USGS scientists and academics. In January 2006, a book about Jim Berkland was published, *The Man Who Predicts Earthquakes: Jim Berkland, Maverick Geologist--How His Quake Warnings Can Save Lives* (by Cal Orey and published by Sentient Publications). In the late 1980s-early 1990s **Frederick W. “Rick” Haltenhoff**, CEG served as the part-time County Geologist, a period that straddled the October 1989 Loma Prieta Earthquake. In May 1994 **Jim Baker**, CEG (BS Geol ’71; MS ’76 Stanford) became the Santa Clara County Geologist with the Planning Department, and he began compiling a credible record of the county’s geohazards, noting where and how they have historically mitigated such hazards.

 Since 1980 the **City of San Jose** Public Works Department has employed an ‘Engineering Geologist.’ **Bill Wahler** GE, CEG held the position from 1984-88, assisted by **Trish Gomes,** CEG. **Mike Shimamoto**,CEG (BA Geol ’74, MS ’76 Humboldt State) took over the reins in the late 1980s and has held the position ever since.

In the early 1970s **Alameda County** established a geologist position. For many years this was **David W. Carpenter**, CEG (who previously worked for the Bureau of Reclamation in Sacramento). He retired around 1985-86 and provided part-time review services for several cities in Alameda County, including **Pleasanton**. His successor was **Ed Danehy** (from Wahler Associates). Since 1995 **Cal Engineering & Geology** has performed geologic peer review services for **Alameda County**, using **Mitch Wolfe**, CEG (formerly of Seidelman Assoc and Rogers/Pacific).

 **Contra Costa County** enacted legislation establishing an excavation and grading ordinance in 1960, modeled on that adopted by Los Angeles County. Their first grading inspectors were **Alan L. Stanley** (who joined Purcell-Rhoades in 1971), **James A. Searfus**, and **Gordon Whisler**, who remained in his position for over 31 years. **John M. Halliday** (BS Geol ’79 SJSU) was the County’s chief grading inspector from 1999 until work fell off, around 2009.

Contra Costa Countyestablished a planning geologist position around 1975. The first Contra Costa County Geologist was **W. Darwin Myers**, PhD, CEG working for Community Planning from 1975-79. He was succeeded by **Jim Baker**, CEG from 1979-81, and then **W. Todd Nelson**, CEG between 1982-90. After Nelson retired, **Darwin Myers** accepted these duties once again as an independent contractor, beginning around 1995. Over the intervening years Myers also provided engineering geologic review on contract for many other cities in **Alameda** and **Contra Costa Counties**.

 Between 1984-97 **Rogers/Pacific** provided peer review for **San Ramon, Danville, Martinez, Pleasant Hill, Orinda, Moraga, Lafayette, Pleasanton, Berkeley, Vallejo**, and **Contra Costa County**. **J. David Rogers**, PhD, CEG, CHG of Geolith Consultants continued this role for **Pleasant Hill, Fremont,** and **Orinda** from 1997-2001.

 From approximately 1974 and 1991 **Gerry Weber**, PhD, CEG of Weber-Hayes & Associates served as the contract **Santa Cruz “County Geologist**,” working for the County Planning Department. Weber’s responsibilities included working with Planning Department staff and Dr. **Gary Griggs**, CEG of the UCSC Earth Sciences Department on the development of ***County Guidelines for the Preparation of Geologic Reports***, and reviewing geologic reports prepared by local consultants (including field review). In the late 1980s-early 1990s **Paia Levine,** PG served in the planning department until a complaint was filed with the BRGG in the spring of 1991, about her not being a registered geologist (she was registered in 1995). In July 1991 **Joe Hanna**, CEG (BA Geol ’78 UCSB) became the Santa Cruz County Geologist, after working in similar capacities for the Ventura County Public Works Department from 1979-91.

 **Gerry Weber** also served as the "Review Geologist" for the **San Benito County Planning Department**, the **City of San Juan Bautista**, the **City of Del Rey Oaks**, and **San Luis Obispo County.** The person who reviewed geology reports in Solano County in the late 1970s was **John Blacklock** (though not registered). **Misty Kaltreider** was the Geologist for the **Solano County Departmental of Environmental Management**.

**Notable Legislation and Associations that influenced development of the Geotechnical Standard of Practice**

(which included Bay Area engineers and geologists)

**U.S. Coast Survey Maps of San Francisco Bay Area (1852 onward)**

 The U.S. Coast Survey (USCS) was the companion agency to the U.S. Surveyor General’s Office, who mapped the interior. USCS began mapping the Pacific Coast in 1848-49, establishing an office in San Francisco in May 1849. In 1852 County Surveyor Clement Humphreys prepared the first detailed map of the San Francisco Peninsula, extending just south of Point San Bruno, in vicinity of what is now the airport. This map was periodically updated as the City expanded, beginning in 1861.

A.F. Rodgers of the Coast Survey prepared a detailed topographic map of San Francisco extending several miles inland, using a contour interval of 20 feet. This was published by the Coast Survey in 1853. Original copies of the 1853 map are held by the USGS, San Francisco Public Library, Bancroft Library, and the Earth Sciences & Map Library at U.C. Berkeley.

The area of the 1853 Coast Survey map was subsequently expanded upon in 1857 and 1869. The 1869 topographic map covers the San Francisco Peninsula as far south as Millbrae and Point San Pedro. It was prepared at a scale of 1:10,000 with contour interval of 20 feet. The map has been reprinted by NOAA (Map BiC-32) at a reduced scale of 1:40,000, beginning in 1969. The Coast Survey completed a 1:10,000 scale map of the San Antonio Estuary in Oakland and Alameda in 1860. They went onto compile a series of harbor and bay maps up through the 1890s. These maps are extremely rare, but are the most reliable source of pre-development information in known wetlands and slough areas, such as the Oakland-Alameda Estuary or San Francisco waterfront.

**Establishment of State Geological Survey (1860)**

 In April 1860 the State Legislature passed an act creating a State Geological Survey and the Office of the State Geologist, naming Josiah Dwight Whitney as the first state geologist. Whitney endeavored to construct an accurate and complete survey of the State’s geologic resources, a Herculean task which occupied the succeeding five years. In 1865 Whitney published a 97-page account (*Geology of California*, *v. 1, part 1, Geology of the Coast Ranges*: Geological Survey of California) that included initial descriptions of the formations surrounding Mt. Diablo.

 The **State Mining Bureau** was created by legislation in 1880 absorbed the Old State Geological Survey. This was, in turn, succeeded by the **Division of Mines and Mining**, headed by a State Mineralogist, and contained within the Department of Natural Resources, with headquarters in the San Francisco Ferry Building. A Petroleum Department was established in 1915, which eventually became the Division of Oil & Gas. In October 1961 the agency’s name was changed to the **Division of Mines & Geology** in a reorganization of the newly created Department of Conservation. A brief history of the agency is contained in the December 1961 issue of *Mineral Information Service* (v. 14:12), the precursor publication of *California Geology*. The agency moved its headquarters from the Ferry Building in San Francisco to Sacramento in 1970. The agency’s name was changed to the **California Geological Survey** (CGS) in 2002.

**First Seismographic Stations in the Americas (1887)**

 In 1887 the University of California (Berkeley) established the first seismographic stations in the Americas, one at Berkeley and the other at Lick Observatory, in the hills east of San Jose. The operation and upkeep of both seismographs was under the direction of the Lick Observatory’s Director **E.S. Holden**. The university’s first course in seismology was not offered until 1912, by **Elmer F. Davis**, a student of Prof Andrew Lawson. Davis supervised the operation of the seismic arrays until he was relieved by Father **James B. Macelwane** in 1921 (Macelwane was also a student of Prof. Lawson and went onto establish the seismology program at St. Louis University). In 1925 Professor **Lawson** asked **Perry Byerly**, a recent graduate in physics at Berkeley, to succeed Macelwane in directing the two seismograph stations. Byerly was appointed Assistant Professor of Seismology in 1927, and continued supervising the seismology program at Berkeley until his retirement in 1960, when they were operating 16 stations across northern California.

**USGS 15-minute quadrangles (1893-1944)**

The U.S. Geological Survey (USGS) began systematic topographic mapping of northern California in the mid-1890s, using plane tables. The scales were between 1:62,500 (about an inch to the mile) and 1:125,000 (about 2 inches to a mile). 15-minute series quadrangles were published of inhabited areas, such as the coastal plains, while 30-minute maps covered less-populated areas, such as the Sacramento Valley and Delta, and mountainous terrain within the Coast Ranges.

The 15-minute series maps were released between 1893 and 1944. Most of these show the original position of water courses and wetlands around the turn of the Century, and as urban areas developed, new editions were published, between 1916 and 1944. The last series of 15-minute quads were produced during the Second World War (1941-45), and omit details within military reservations, such as Alameda Naval Air Station and the Oakland Army Base. These maps were also replicated as base maps for other products, such as mining, soil science, and water resources studies.

**Bureau of Public Roads (1893-1919)**

 The **U.S. Office of Road Inquiry** was established with the Department of Agriculture in October 1893, naming General **Roy Stone** as its first Special Agent and Engineer. The first ‘object lesson highway’ demonstration project was constructed in New Jersey in 1897. In 1903 Congress tripled the agency’s budget, changing its name to the **Office of Public Roads Inquiries** and appointing **Martin Dodge** as the new Director. He divided the USA into four geographic divisions with a special agent in charge of each. In 1905 the agency was enlarged 67% and renamed the **U.S. Office of Public Roads**, with **Logan W. Page** as its new director. Under Page’s leadership a Division of Highway Bridges & Culverts was formed in 1910, the American Association of State Highway Officials (now AASHTO) was established in 1914. In 1915 the agency’s name became the **U.S. Bureau of Public Roads**, followed shortly thereafter by passage of the Federal-Aid Road Act of 1916, establishing the financing of highways, using 50% federal and 50% state funds. In 1918 the agency established the ***Bureau of Public Roads Experimental Farm*** in Arlington, VA to measure impact forces of various wheel loads. The agency began published the journal ***Public Roads*** in May 1918. When Page retired in 1919 he was replaced by **Thomas H. McDonald**, a legendary figure who led the agency for the next 34 years, until 1953. From the late 1920s onward the importance of soil mechanics theory to pavement design and construction became increasingly appreciated, and most of the pre-1940 research in soil mechanics was geared towards improving pavement design.

In 1939 the agency was renamed the **U.S. Public Roads Administration**, and placed under the Federal Works Agency. When that agency was shut down in 1949, its name reverted to the **Bureau of Public Roads** and it was placed within the Department of Commerce. This was superseded by the establishment of the **Federal Highway Administration** and the new Department of Transportation in October 1966, which became operational in April 1967.

**Bureau of Soils (1901)**

 In 1894 the **Division of Agricultural Soils** was created in the Weather Bureau of the Department of Agriculture. With the inception of **National Cooperative Soil Survey** efforts, in 1899 the name changed to the Division of Soils, with a marked increase in funding. The first four surveys focused on portions of Maryland, [Connecticut](http://en.wikipedia.org/wiki/Connecticut), the [Salt Lake Valley](http://en.wikipedia.org/wiki/Salt_Lake_Valley) of [Utah](http://en.wikipedia.org/wiki/Utah), and the [Pecos River](http://en.wikipedia.org/wiki/Pecos_River) Valley of [New Mexico](http://en.wikipedia.org/wiki/New_Mexico). These early efforts were focused on geology/geography and chemistry, with little or no input from agronomists.

 In 1901 the **Bureau of Soils** was established with the USDA. In that era soil texture was the principal soil characteristic described in maps and reports, but soil series were soon established as groupings of distinctive [soil types](http://en.wikipedia.org/wiki/Soil_type). Other characteristics, such as [soil color](http://en.wikipedia.org/wiki/Soil_color), [organic](http://en.wikipedia.org/wiki/Organic_matter) content, [soil structure](http://en.wikipedia.org/wiki/Soil_structure), drainage, [erodibility](http://en.wikipedia.org/wiki/Soil_erosion), and nature of [subsoil](http://en.wikipedia.org/wiki/Subsoil) were gradually added to studies over the following decades. Some of these included soil provinces with their respective soil series where dominant depositional provinces were recognized, such as glacial, aeolian, [alluvial](http://en.wikipedia.org/wiki/Alluvial) etc. Whenever USGS topographic sheets were available soil maps were overlain on these. Most of these early surveys were published at a scale Work for soil surveys was done at a [mapping scale](http://en.wikipedia.org/wiki/Scale_%28map%29) 1 inch to the mile. In other cases early soil surveys were made using plane table and [alidade](http://en.wikipedia.org/wiki/Alidade) surveys to develop their own base maps. Gradually the scale increased until, by 1960, it was pretty well standardized at 1:12000 or 1:24000, depending on the area.

 In the San Francisco Bay-Delta area, soil surveys commenced around 1908. Some of the earliest soil maps include: H.L. Westover and C. Van Duyne, 1912, ***Soil Survey of the Livermore Area, California***: U.S. Dept. Agriculture Bureau of Soils Field Operations 1910, Report 12, p. 1657-1716. Larger tracts of land were subsequently reported upon, such as L.C. Holmes and J.W. Nelson, 1919, ***Reconnaissance Soil Survey of the San Francisco Bay Region, California***: U.S. Dept. Agriculture, Bureau of Soils, Field Operation 1914, Report 16, p. 2679-2784. Similar reports were prepared for the Sacramento Valley (1916) and Lower San Joaquin Valley (1919). Up through the 1920s these soil surveys were contained in massive annual reports produced by Bureau of Soils. These activities were subsequently absorbed into the **Soil Conservation Service**, beginning in 1933 (see write-up, below).

**Seismological Society of America (1907)**

 The Seismological Society of America (SSA) was formed in California in the aftermath of the San Francisco earthquake of April 1906. San Francisco civil engineer **William R. Eckert** suggested to his friend **Alexander G. McAdie** that they should form a society “to promote research in seismology, the scientific investigation of earthquakes, and related phenomenon.” Thirteen individuals attended the first organizational meeting on August 30, 1906 in San Francisco.

 Six of the core group were six professors at the University of California, Berkeley: **George** **Davidson** was Professor Emeritus of Geography; **Charles Derleth** was Professor of Structural Engineering; **Andrew Lawson** was Head of the Department of Geology. **Joseph N.** **LeConte** was Professor of Mechanical Engineering, **A. O. Leuchner** of Astronomy, and **George Louderback** of Geology and Mining. SSA was unique in that it was the first scientific society that included both scientists and engineers, working together towards common interests and practical goals.

 The stalwarts of the early years were Stanford Professors **Bailey Willis** and **S. D. Townley**, along with noted consulting engineers **John R. Freeman** of Boston, Professor **Romeo R. Martel** of Caltech, and San Francisco consulting engineers **Henry D. Dewell** (BSCE 1906 Berkeley) and **Walter L. Huber** (BSCE 1905 Berkeley). Willis and Dewell (1881-1946) were tireless in their efforts to promote the adoption of seismic building codes in California. This effort met with modest success following the June 1925 Santa Barbara Earthquake, and with overwhelming success in the wake of the March 1933 Long Beach Earthquake. By the late 1920s the society numbered over 800 members and today numbers approximately 2,000 members.

**California State Department of Highways (1911)**

 In 1911 California Governor Hiram W. Johnson named **Austin B. Fletcher** to lead the newly formed State Highway Department. Fletcher was a graduate of Harvard University in 1893 who began his career as secretary and and then executive officer of the Massachusetts Highway Commission from 1893-1910, when that agency constructed more than 800 miles of paved highways.

In 1910 Fletcher accepted the position of Secretary-Engineer of the San Diego County Highway Commission, where he served until Nov 1907, when he moved to Sacramento. During his tenure with the State Highway Department he also served as California’s Director of Public Works and as President of the State Reclamation Board, until 1923, when he became Consulting Engineer to the United States Bureau of Public Roads in Washington, DC.

 Fletcher was known for his ability to recruit outstanding people like famed geotechnical pioneer **Thomas E. Stanton** to serve as the initial cadre of field engineering personnel, endowing it with a high spirit de corps (Stanton supervised the materials and research group in Sacramento from 1928-51, and contributed noteworthy articles to the 1st and 2nd International Conferences on Soil Mechanics & Foundation Engineering). By the time Fletcher departed in 1923 he had hired every district engineer and every department head of the California Highway Commission. He was lauded for “no public executive in California ever had a more loyal following and devoted staff during his tenure as State Highway Engineer, which witnessed some pioneering work in developing early pavement engineering standards through the employment of “pavement test tracks” at Columbia Steel Mill in Pittsburg, CA in 1921-22 to collect long-term pavement performance data by running different wheel load configurations on a dowen different pavement sections continuously (24/7) to ascertain which designs perfomed best on “Pittsburg Silty Clay.” These went onto become national pavement design standards.

**First use of the term “geotechnical” (1913)**

 In 1913 a “***Geotechnical Commission of the Swedish State Railways***” was appointed, chaired by **Wolmar Fellenius**, a professor of civil engineering at the Royal Institute of Technology in Stockholm. That commission studied a number of slope stability and bulkhead failures that had impacted the Swedish Railway system and issued a report in 1922 that was circulated in the United States, through ASCE’s ***Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations*** (reported on pages 715-16 of the December 1922 *ASCE Proceedings*). The term “geotechnical” was eventually adopted by soils and foundations engineers world-wide, to better describe the many faceted aspects of their profession, which involved soils, rock, water, and organic matter.

**Dam Safety Acts of 1915 and 1917**

In 1915 the California legislature passed its first dam safety legislation, which required all plans for dams and reservoirs to be submitted to the State Engineer for approval, but the act provided no penalty for failure to comply. In August 1916 the State Reclamation Board issued a report recommending that the State Engineer regulate all storage reservoirs. No further action was taken by the legislature until after January 1916 floods in Southern California. In 1917 a new dam safety act was enacted in the wake of public outcry following the failures of the Lower Otay and Sweetwater Dams in San Diego County during the floods of January 1916. The 1917 act granted the State Engineer authority over all dams > 10 feet high or which impound > 9 acre acre-ft (3 million gallons), with exception of: 1) dams for mining debris constructed by the California Debris Commission; 2) dams constructed by municipal corporations maintaining their own engineering departments (such as Los Angeles BWWS); and 3) dams and reservoirs that are part of water systems regulated by the State’s new Public Utilities Act.

That same year (1917) the State Railroad Commission was given authority over all dams owned by public utilities. The railroad commission exercised some oversight on 46 of 140 dams built in California between 1917-1929. Municipal water agencies, such as publicly-owned agencies and districts, were exempt from State overview (until the 1929 legislation). From 1917-29 the State Engineer was given authority to review plans for dams prepared by irrigation districts, private companies and individuals. In 1920 the Federal Power Commission began supervising dams for power projects involving the public domain.

**ASCE Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations (1915-26)**

 In 1915 a Committee to Codify Present Practice on the Bearing Value of Soils for Foundations was formed by the American Society of Civil Engineers, chaired by **Robert A. Cummings** (1866-1962), Consulting Engineer from Pittsburgh, who founded the Cummings Structural Concrete Co. in 1884, and was an early proponent of reinforced concrete construction. Another member of the committee was famed sanitary engineer and hydrologist **Allen Hazen** (1869-1930). The committee solicited input from practitioners across the nation and published annual reports of up to 40 pages in length in the ASCE Proceedings between 1916-26 (Cummings served as a Director of ASCE from 1914-20 and as Vice President in 1920 and ’21). These empirical values became industry standards until the more rigorous methods of assessing bearing capacity of soils were developed by G.G. Myerhoff between 1950-55.

**Board of Engineers for the Calaveras Dam (1917)**

With a design height of 240 feet height and a volume of over three million cubic yards, the Calaveras Dam was intended to become the largest embankment dam in the world when it was designed in 1916. Construction began in January 1917, using hydraulic fill techniques.

In the spring of 1917 **George A. Elliott**, PE Engineer of the Spring Valley Water Company of San Francisco, prepared a report titled “***Report on the Spillway for the Calaveras Reservoir***, “ which was approved by **William Mulholland**, Chief Engineer of the Los Angeles Bureau of Waterworks & Supply, who served as a consulting engineer to the Spring Valley Water Co.

 The company also appointed a board of engineers to advise them on the design of the proposed Calaveras Dam. The original board was comprised of **Arthur Powell Davis**, Director of the U.S. Reclamation Service (and General Manager & Chief Engineer of EBMUD from 1923 to 1932), and Professor **Daniel W. Mead** of the University of Wisconsin. They submitted a “***Report on the Calaveras Dam and Spillway***” dated July 6, 1917.

**Coining of the term “liquefaction” (1918-21)**

 On Sunday morning March 24, 1918 approximately 800,000 yds3 of the upstream side of the **Calaveras Dam** took about five minutes to slide into the partially-filled reservoir (it contained about 55 ft of water), toppling the 230-ft high intake tower. The core pool had been placed to a height about 45 feet below the design crest of the dam at the time of the failure, with either shell about 10 feet higher.

The Spring Valley Water Company hired renowned waterworks engineer **Allen Hazen**, C.E. (1869-1930) to study the dam’s failure and provide recommendations as to how the dam might be completed. Hazen memorialized his findings in the classic paper titled “***Hydraulic Fill Dams***,” in the 1921 ASCE Transactions (vol. 83:1713-1805). Hazen recognized the slope movement as a classic flow failure, which led to the establishment of the term “***liquefaction,***” which Hazen described as the “***quicksand condition in dams***,” relating safety factor to the void ratio of the material. Hazen asserted that somewhere between a void ratio of 40% and 50% the core material became unstable, and that this observation was consistent with other failures or partial quicksand failures that had been observed in other hydraulic fill dams, such as Necaxa Dam in Mexico (at 192 ft, the highest dam in the world at the time Calaveras Dam failed). Hazen concluded that the greatest problem with Calaveras Dam was the high percentage of clay, which remained in a suspended fabric, more resistant to normal consolidation. Hazen recommended using core materials of considerable coarseness, not less than 0.02 mm. In situations with wide clay-rich cores, flatter side slopes should be employed on the sloping shells, and all attempts should be made to compact the materials as much as possible, to reduce their void ratio to 40% or less.

A separate forensic analysis of the Calaveras Dam failure was carried out by consulting engineers **C. H. Swigart** (Supervising Engineer for the Corps of Engineers in the Pacific Northwest) and **David C. Henny** (consulting engineer from Portland) for the U.S. Reclamation Service, dated May 25, 1918. Henny disagreed with Hazen’s back-analysis of the average basal friction coefficient being 0.20, stating that it was probably much larger beneath the sloping shells comprised of more coarse grained materials, likely in the range of 0.50 to 0.70. Henny calculated the friction coefficients at San Pablo Dam, then under construction, about 20 miles northwest of Calaveras Dam, and found values of 0.45 to 0.55, with less than 200 feet of overburden. He felt that these figures would be closer to 0.70 when the embankment rose to a level approaching 200 ft, which was the approximate height of the Calaveras Dam when it failed in 1918.

Reconstruction of the dam was not completed until 1923, and the overall height was reduced by 25 feet. The slide material was removed and reworked, and the new core was placed more slowly, using hydraulic fill methods with periodic measurements of core fill density. The reservoir level was also raised during construction to provide more lateral stability.

These discussions were invaluable in trying to understand the mechanisms involved in triggering massive Fort Peck Dam failure of Sept 1938, after Hazen and Henny had both passed away. These revelations are described in **Arthur Casagrande’s** 1965 ***Terzaghi Lecture***, published in the ASCE *Journal of the Soil Mechanics & Foundations Division* 91:SM4 (1-40).

**Highway Research Board (1920)**

 The Highway Research Board (HRB) was organized on November 11, 1920 as an agency of the Division of Engineering & Industrial Research, one of eight divisions of the National Research Council, which had been established in 1916, shortly before America’s entry into the First World War. The HRB was intended as a cooperative organization between the “highway technologists” of America, in support of the U.S. Bureau of Public Roads, state highway agencies, and a the few academic researchers beginning to engage in practical issues related to pavement design. The HRB was intended to encourage research and provide a national clearinghouse and correlation service for research and information on highway administration and technology. The expansive adobe clay soils in California created a very real need for highways that could withstand large seasonal fluctuations in soil moisture content, which catapulted California to the top of the emerging science associated with pavement design during the 1920s. From these efforts to understand and characterize subgrade materials came the recognition and appreciation of the emerging field of soil mechanics.

 The establishment of the HRB soon led to extensive track tests at Columbia Steel Mills in Pittsburgh, CA, a cooperative project of the California Division of Highways of the State Department of Public Works, the U.S. Bureau of Public Roads, and several other agencies. These tests led to the development of R-values to characterize pavement subgrade materials (in 1927), and the first subgrade compaction test standard (California Test Method 217 in 1929), which had widespread influence, nationally. More extensive tests using larger construction equipment was carried out during the Second World War at Stockton Army Airfield. This led to the development of flexible pavement design methodologies which dominated the post-war transportation sector, and the Modified Proctor Compaction test (AASHTO T180), for airfield runways (in 1945), which was eventually adopted by ASTM in as Test No D-1557 in 1958. This became the statewide standard in the 1985 Edition of the Uniform Building Code and the 1986 California Building Code, when UBC Standard 70-1 (introduced in 1964) was eliminated.

**Early publications on mitigation of landslides (1920)**

In 1920 **Halbert P. Gillette** of Chicago, IL and San Marino, CA, Editor of the serial journal ***Engineering and Contracting***, published a detailed review of landslides and the various methods employed to mitigate their dangers in Chapter XXII ***Slips and Slides*** of his text ***Earthwork and Its Costs: A handbook of earth excavation***, published by McGraw-Hill. It included 51 pages of text with numerous ink drawings, and a detailed bibliography of engineering literature pertaining to the study of landslides and their mitigation up til that time (pre-1920). Gillette spent the winters in the Los Angeles area, and his younger brother Walter was a contractor in the Los Angeles area, with whom he invented the sheepsfoot roller in 1905 (see description of “**The First Sheepsfoot Compactor, 1902-03**,” in the southern California threadline).

**“Tests of California Adobe Soils” (1921)**

 In the fall of 1920 University of California (Berkeley) civil engineering Professor **Clement T. Wiskocil** performed a series of tests on adobe soils of California at the request of the Automobile Club of Southern California and the California State Automobile Association, titled “***Laboratory Experiments: A Preliminary Study of Adobe Soils and Concrete Slab Tests,***” dated January 17, 1921 (available on Google Books). The work was performed under the direction of Berkeley Dean of Engineering Charles Derleth by Clement Wiskocil, who directed the university’s Materials Research Laboratory. These studies included sieve analyses, assessment of soil volume change (percent soil moisture) and linear shrinkage tests, and to a smaller extent, the impacts of adding lime and sand to adobe clay, and the expansive forces engendered when adobe is under confinement. These test results were subsequently cited in numerous reports and articles on pavement design that appeared over the ensuing decades, as the “starting point” for all similar soils tests thereafter, in California and elsewhere.

**First course on foundation engineering in California (1921)**

 **Professor Charles Derleth** at the University of California (Berkeley) taught the first course on foundation engineering in the San Francisco Bay Area, summarized in the document: “***Notes on Foundations and Masonry Structures***” for Senior Courses in Civil Engineering at the University of California, dated October 1921.

**“Differing Site Conditions” clause introduced (1921)**

 The first standardized “***changed conditions***” clause was developed by the Interdepartmental Board of Contracts and Adjustments on November 22, 1921 by the U.S. Bureau of the Budget. The new clause was intended to provide a contractual basis for contractors that encountered site conditions that were more adverse than those indicated in the construction contract. The changed conditions clause was thereafter included in a standard form of general conditions for construction contracts issued after August 20, 1926. To this day, Federal Regulations mandate its use in U.S. Government contracts. This clause was subsequently adopted in the standard contract documents sponsored by the Engineers Joint Contract Documents Committee of ACEC, ASCE, and NSPE; the AIA, ASCE in collaboration with the Associated General Contractors of America; AASHTO, and numerous state and municipal agencies. In 1968 the term “changed conditions” was revised to “differing site conditions,” commonly referred to as the “DSC clause.”

**First bridge designed for distribution of earthquake forces (1924)**

 The **Carquinez Straits Toll Bridge** between Crockett and Vallejo was built by the American Toll Bridge Company for a cost of $8 million, contributed by private investors. Berkeley Professor **Charles Derleth, Jr.** served as Chief Engineer for the project, but **David B. Steinman** of New York served as the Designing Engineer (Steinman went onto considerable fame as a bridge engineer and one of the fathers of the National Society of Professional Engineers, in 1934). Columbia University Professor **William H. Burr** served as the project’s Consulting Engineer, reviewing the project plans and construction.

During the design process Steinman was tasked with considering how seismic loads might best be handled, to prevent the bridge from suffering undue damage or closure, in the event of an earthquake similar to that which had destroyed San Francisco in 1906. In an attempt to spread seismic loads to the eight caissons and the Crockett bulkhead, Steinman developed expansion stops and hydraulic buffers placed across all the bridge’s expansion joints, to limit the amount of possible sudden movement, such as that caused by earthquakes. These have come to be known as “***Shock Transmission Units***” (STU’s). His STUs were placed between the bridge’s expansion joints and bearings to form a rigid link under rapidly applied loads, such as earthquakes, explosions, or wind gusts, but move freely under slowly applied loads, like temperature and creep shrinkage. This was accomplished by using dashpots that employ sufficiently viscous fluids that will not easily flow through a narrow gap, orifice, or valve, thereby generating considerable resistance. But, if the loads are applied slowly, there is little resistance. Six STUs were employed in the 1927 span, and the same number of high capacity STUs were also embedded in second, wider span, built by the California Division of Highways in 1956-58 (these were replaced with 1800 ton STUs in 2002-04).

The final design employed two main spans of 1100 ft each with an intervening cantilever span of 3,350 ft, making it the longest cantilever bridge in the United States. The bridge’s clearance over the channel varied from 122 to 160 ft, from south to north. Eight caissons were sunk through up to 90 ft of water and up to 45 ft of sediment, overlying the bedrock (for a total depth of 135 ft), making them the deepest water piers ever built up to that time.

The bridge was constructed between February 1925 and May 1927. It was operated privately for 13 years, until being purchased by the State of California in September 1940, who operated it as a toll bridge until it was paid off, on August 1, 1945. In 1958 a second bridge was completed by the State Division of Highways for Interstate 80, and the westbound lanes were routed onto the 1927 span. The bridge was dismantled in 2007 after a new suspension span was constructed just downstream.

**First use of mechanical compaction on embankment dam in northern California (1926)**

The first earth embankments compacted with sheepsfoot rollers were the Lake Henshaw Dam in 1920-23 for the Vista Irrigation District in San Diego County. This was followed in 1926 by **Philbrook Dam** for **Pacific Gas & Electric Co.** in the northern Sierras by R.G. Letourneau and Henry J. Kaiser, and the Puddingstone Dam for the Los Angeles County Flood Control District in 1927, using a new roller patented by contractor H.W. Rohl that employed ball-shaped heads. The first earth dam compacted by sheepsfoot roller for a federal agency was Echo Dam in Utah, for the Bureau of Reclamation in 1928. The sheepsfoot roller’s narrow spikes induced *kneading compaction,* critical for densification of clayey soils.

**Development of the Uniform Building Code (1925-27)**

 The Uniform Building Code came about as a result of the Magnitude 6.3 Santa Barbara earthquake of June 25, 1925. This quake caused $6 million in damage to a city with only 30,000 people. The quake also came on the heels of the Great Kanto Earthquake of 1923 (M 7.9), which burned much of Tokyo to the ground and killed 143,000 people. In the wake of the terrible losses suffered in Santa Barbara, the nation’s largest insurers asked the Seismological Society of America (SSA) to provide future seismic risk assessments. The Board of Fire Underwriters of the Pacific funded several research projects aimed at assessing the earthquake hazard risks for various building types, making unreinforced masonry structures virtually uninsurable. When these assessments were released, they were so alarming that most lending institutions refused to invest in any further construction in the Los Angeles Area.

This led to a crisis involving the California State Chamber of Commerce, the California Development Association, the Los Angeles Chamber of Commerce, and SSA. SSA officials met with local governments and encouraged them to consider the adoption of seismic design tenants in their building codes, while the Los Angeles Chamber of Commerce hired retired USGS geologist R.T. Hill to debunk and discredit everything SSA President, Stanford Geology Professor Bailey Willis (also a retired USGS geologist) had to say about increased seismic risk in southern California.

 On October 18-21 the **Pacific Coast Building Officials Conference** (PCBOC) convened in Los Angeles and hammered out a new **Uniform Building Code** (UBC), which was published by PCBOC. The primary purpose of the PCBOC was to establish regulations and standards for building safety. In March 1956 the PCBOC was conjoined with several other building code conferences to form the much larger **International Conference of Building Officials**, known as ICBO. While ICBO had no legal authority to create laws, most cities in the western United States adopted ICBO standards after 1956. Revised editions of this code were published approximately every three years, up through 1997.

 From 1927-94 PCBOC/ICBO was headquartered in Los Angeles and from 1956, in Whittier. During the late 1950s and throughout the 1960s ASCE, CCCE, AEG, and ICBO formed numerous joint committees to explore the establishment of suitable standards for foundation engineering, grading and excavation. These consultations resulted in the establishment of Expansion Index Test (UBC Test 29-2/18-2), adopted in 1967; and the UBC [compaction] Test Standard 70-1, adopted in 1967 (and discarded in 1985).

**First textbooks on soil mechanics (1925) and engineering geology (1929)**

 In 1925 Austrian engineer and geologist **Karl Terzaghi** published the first textbook on soil mechanics in German, titled ***Erdbaumechanik*** (Soil Mechanics), while he was a professeor at Robert College in Constantinople. The appearance of this new branch of engineering knowledge led to an invitation for Terzaghi to serve as a visiting professor at the Massachusettes Institute of Technology between 1925-29, where their new Engineering Building was experiencing severe settlement problems. While he was in Cambridge, MA Terzaghi finished writing his second, and much larger text book, titled ***Ingenieurgeologie*** (Engineering Geology), with co-authors **Karl A. Redlich** and **Rudolf Kampe**, also in German, and released in 1929.

**First dam designed for fault offset (1926-27)**

 The **Stony Gorge Dam** was designed and constructed by the U.S. Bureau of Reclamation as part of their Orland Irrigation Project, along the western side of the Sacramento Valley. The dam was a concrete buttress Ambursen-type structure with a maximum height of 120 ft and length of 900 ft, with a reservoir capacity of 51,000 ac-ft. The foundation was explored using test pits and 10 boreholes, from 30 to 110 ft deep, probing a conglomerate unit that most of the structure was founded upon. The dam’s foundations were then examined by Berkeley economic geology Professor **Carlton D. Hulin**, (BS ’20, PhD ’24 Berkeley) who was a mining geologist. He confirmed the suspicion that the channel of Stony Creek was structurally controlled by a fault, passing beneath the dam. Hulin determined that the fault had moved at least 150 ft, and that although it was old, it might be capable of “some slight lateral movement.” He believed that problems with seepage and performance could be assuaged using a careful program of foundation grouting. A line of grout holes along 200 ft of the fault were drilled, on 10 ft centers to a depth of 30 ft. As a precaution, Reclamation Chief Designing Engineer **John L. “Jack” Savage** shifted the spillway and outlet works away from the fault, so that any future movement would not impact those critical elements. Two 18 ft wide non-continuous slabs were employed across the fault because it was thought the best system to accommodate minor foundation movements along the exposed fault. They also applied plastic asphalt putty between the face slabs and the supporting buttress elements. The employment of these novel mitigation measure led to similar schemes being developed for faults constructed across potentially active faults a few years later, at **Rodriquez Dam** in 1930, **Morris Dam** in 1933-34, **Coyote Dam** in 1934-36, and Baldwin Hills Reservoir embankment in 1953-54. Several other dams were reconfigured to avoid being founded on potentially active faults in California. These included **San Antonio Dam** in 1952-56, and **Cedar Springs Dam** in 1964-67.

**California Bearing Ratio Test (1928)**

 This was a novel test procedure developed by **O. James Porter** of the **California Division of Highways** in the late 1920s, in Sacramento. Porter took subgrade soils from proposed highway alignments and removed the fragments >1/4 inch, then compacted the soil in a cylindrical mold, six inches and diameter and five inches high (1/12th ft3). The samples were then submerged for a known period and then its resistance to a penetrating needle is measured, which is then compared to a “standard resistance” for crushed limestone. The determined resistance was then divided by the standard resistance and multiplied by 100, and referred to as the “**California Bearing Ratio**” (CBR). It was intended to evaluate subgrade strengths in the investigation of existing pavements and aid in selecting granular subbase beneath pavements.

 The empirical test regimen was extrapolated over the succeeding two decades to estimate soil suitability for increasing wheel loads, far beyond what anyone imagined in 1928 [Porter O.J., 1939, The preparation of subgrades: *Proc. Highway Res. Bd,* Wash., v.18:2, 324-31; and ENR Mar 21, 1946, p.422]. During the Second World War, Porter and the Army Corps of Engineers developed a protocol using the CBR test to evaluate subgrade strength for pavement design of airfields (O.J. Porter, 1942, "***Foundations for Flexible Pavements,***" Proceedings, Highway Research Board, Washington, D.C., Dec; O.J. Porter & Co. (1949). Accelerated Traffic Test at Stockton Airfield Stockton, California (Stockton Test No. 2)," Corps of Engineers Sacramento District, Department of the Army).

From 1945 onward this method was used almost exclusively for flexible pavement design by the California Division of Highways and the Army Corps of Engineers because the Corps published simple pavement design correlations based upon the CBR values. These procedures ushered in the modern era of flexible pavement design, making Porter a high visibility figure.

**First soil compaction standard (1929)**

 The first published standard for testing the mechanical compaction of earth was the California State Impact Method, or “California Impact Test.” It is now known as California Test 216 – “***Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates***.” It was developed in 1929 by **O. James Porter,** PE (1901-67) of the **California Division of Highways** in Sacramento. It presented a procedure for ascertaining the in-place wet density of aggregate baserock or compacted soil, and the preparation of a wet density versus soil moisture content curve (similar to what Proctor later proposed, using dry soil density, described below). The 216 test uses wet density as the measurement standard and has been modified six times since its original adoption in 1929 (see F.N. Hveem, 1958, “Suggested Method of Test for the Moisture-Density Relations of Soils (California Method),” ***Procedures for Testing Soils***, ASTM, Philadelphia, pp. 136-39). The current version of the test used to be referred to as California Test Method No. 216-F, which employs energy input of 37,000 to 44,000 ft-lbs/ft3 of soil.

**Adoption of Engineering Registration (1929)**

In 1907 Wyoming was the first state to register engineers. A registration act for engineers had been passed by the State Assembly and Senate in Sacramento in 1925, but it failed to gain the governor’s approval. Engineers promoting registration then formed the California Engineers Registration Association (CERA) on March 10, 1928, just two days before St. Francis Dam failed. As it turned out, their timing was fortuitous, as the public clamored for “something to be done” to better ensure public welfare and safety in the wake of the dam’s failure, which killed about 432 people. CERA’s rolls swelled to 600 members by November and politicians were eager to demonstrate to the public that they were making sweeping changes to the status quo.

The **Civil Engineers Registration Bill** sailed through the state legislature in early July 1929 and became law on August 14th. Right up to its adoption, the act was vigorously opposed by a number of professional organizations, such as the American Institute of Mining Engineers and the American Society of Mechanical Engineers. The new act defined civil engineering as: “that branch of professional engineering which deals with the economics of, the use and design of materials of construction and the determination of their physical qualities; the supervision of the construction of engineering structures; and the investigation of the laws, phenomena and forces of nature; in connection with fixed works for: irrigation, drainage, water power, water supply, flood control, inland waterways, harbors, municipal improvements, railroads, highways, tunnels, airports and airways, purification of water, sewerage, refuse disposal, foundations, framed and homogeneous structures, bridges, and buildings. Furthermore, it included city and regional planning, valuations and appraisals, and surveying, other than land surveying as already defined in Statutes adopted by the legislature in 1891 (the first engineering registration act in the United States) and amended in 1907. It mandated that any person who practices or offers to practice civil engineering in any of its branches must be registered, and created The Board of Registration for Civil Engineers.

The act also directed that civil engineers in state service must be duly registered if they served in a capacity of ‘Assistant Engineer” or higher. The California Supreme Court quickly issued rulings that a contract for engineering services was invalid if the party undertaking to furnish engineering services was not registered and the State’s appellate courts ruled that engineers offering expert testimony should be registered, although it left the ultimate decision to the discretion of individual judges because some individuals had previously been qualified as experts, before passage of the registration law.

The act allowed the three-person board to develop standards for applicants over a two-year period and to survey registration standards being employed by other states, for purposes of comparison. California made a comprehensive study of procedures practiced in 25 other states and seven Canadian provinces which had laws regulating engineering practice. The standard California adopted required applicants to be at least 25 years old, a legal resident of the state for at least one year (waived for those willing to sit for the examination), and demonstrate more than six years of professional practice, including at least one year of being in “responsible charge.” Applications had to be supported by at least four engineers unrelated to the applicants by family or marriage, who could vouch for their character, experience, and technical competence, before they would be eligible to sit for the written examination. The board allowed a college degree in engineering to be the equivalent of four years’ experience, while graduate work in engineering could be credited for up to one year of experience (California did not offer doctorate degrees in civil engineering until sometime later, but this discrepancy has never been amended).

5,700 individuals applied for civil engineering registration during the first-year applications were accepted, more than double what the state board had expected. Grandfathering was only allowed for the first 10 months, until June 30, 1930, after which time, applicants would be required to take a written examination. Many of those who applied for grandfathering were asked to appear before the three-man board (appointed by the governor) for oral interviews. The basic determinant for “gray area” cases was whether applicants had entered the profession from the labor ranks of construction, this experience was not deemed to be ‘engineering experience.” Of those who applied the first year, 5,035 were accepted, providing the State of California with about one registered engineer for every thousand people then living in the state! It took California the next 25 years to register the next 5,000 civil engineers. Many states followed the examples demonstrated by New York and California. By 1932, 28 states had enacted professional registration for civil engineers. In 1947 Montana became the last state of the original 48 to adopt PE registration.

Over the years, the Board has experienced some major changes under the provisions of the Professional Engineers Act. The number of branches of engineering regulated by the Board has increased, and the status of some of the older branches has changed. When electrical and mechanical engineering were first covered by the registration law in 1947, the law only affected the use of the titles. In 1967, the Act was amended to regulate the practice of those branches, as well as the titles. In the late 1960s and early 1970s, the Act was also amended to give the Board the right to accept additional branches of engineering into the registration program. The additional categories were for the purpose of regulating the use of the titles of those engineering branches. Between 1972 and 1975, the Board expanded the registration program to include nine additional branches of engineering under its jurisdiction. In 1986, at the Board's request, the authority to create new title registration branches was removed from the Act. In the late 1990s and early 2000s, four of the title registration branches were deregulated.

In 2009 the Board of Registration for Geology & Geophysics was absorbed into the Board of Registration for Professional Engineers and Land Surveyors (BORPELS). On January 1, 2011 it was renamed the Board for Professional Engineers, Land Surveyors, and Geologists.

**California Dam Safety Act of 1929**

 In the wake of the St. Francis Dam failure, the state passed a much more comprehensive Dam Safety Act on August 14, 1929. The Act empowered the State Engineer to review all non-federal dams > 25 feet high or which impound > 50 acre-feet of water. The act also allowed the State to employ consultants, as deemed necessary. The State Engineer was given $200,000 and instructed to examine all dams in California within three years and issue recommendations. The State Engineer was given full authority to supervise the maintenance and operation of all non-federal dams (exempting those constructed by the Army Corps of Engineers and the Bureau of Reclamation)

 Between August 1929 and November 1931 the State Engineer inspected 827 dams. One third were deemed to exhibit adequate safety, while another third were recommended for further examination, such as borings or subaqueous inspection, before a determination could be made. The remainder, roughly, another third, were ascertained to be in need of alterations, repairs or changes; frequently involving spillway capacity.

 After this there followed a six-year program of dam safety inspection, which were concluded in July 1936. During this period 950 dams were inspected; with 588 of these dams being under the State’s jurisdiction. One third of these dams were found in need of repairs. New dam construction was also placed under state observance from August 1929 forward.

**First lecture notes in English on soil mechanics (1929-30)**

 In October 1929 Professor William S. Housel in the Department of Civil Engineering at the University of Michigan prepared a 117 page text titled ***“A Practical Method for the Selection of Foundations Based on Fundamental Research in Soil Mechanics,***” released as University of Michigan Engineering Research Bulletin No. 13 (and published by Waverly Press in Baltimore). This volume was primarily focused on the determination of soil bearing capacity for spread footings and resulted from a cooperative research project between the university and the Wayne County Road Commission in Detroit, between 1927-29. This book was used by Professor Fred Converse at Caltech when he taught his first soil mehcanics course in the spring of 1934.

 In 1930 Glennon Gilboy, Sc.D., an Assistant Professor of Soil Mechanics at MIT, self-published a 62-page monograph titled “***Notes on Soil Mechanics: Prepared for Use of Students of the Msssachusetts Institute of Technology,***” which he copyrighted as a first edition. Gilboy had been a doctoral student of Professor Karl Terzaghi while he was as a visiting scholar at MIT, from 1925-29. This work was essentially America’s first English volume on the broader spectrum of soil mechanics, which included chapters addressing soil structure, mechanical analysis, permeability, and consolidation theory. It featured detailed ink drawings of the various laboratory tests then in use, along with example calculations, including Gilboy’s doctoral research on consolidation of the clay core of the massive Germantown Dam near Dayton, Ohio, using hydraulic fill technology in the early 1920s.

**Evolution of Porter Soil Samplers (1930-47)**

In 1930 Omer James Porter of the California Division of Highways began developing a ***retractable plug sampler***, which came to known as the “**Porter Type Soil Sampler**.” The device underwent a series of improvements over the next six years, based on experience. This inexpensive sampler was widely employed over the next 50 years to recover 1-inch to 2-inch diameter samples. The device employed a lockable plug at the foot of the sampler, which remained in place while the sampler rings were driven ahead to the desired depth. When the desired depth interval was reached, the plug was retracted up inside the sample barrel, and the open sample barrel advanced ahead of its starting position, to recover between 18 inches to five feet of relatively undisturbed soil sample (depending on the mean grain size diameter).

The device enjoyed much success because a vacuum was maintained during driving, aiding in recovery of samples. Porter Samplers came in a variety of diameters and lengths. The one-inch diameter samplers were designed for manual operations in soft soils and were limited in their application to depths of up to 60 feet. This sampler employed an outside diameter of just 1.25 inches with 1-inch sampler barrel. The one-inch sampler was usually set up by a three-man crew using a portable tripod.

In 1933 Porter introduced a three-inch diameter sampler intended to recover undisturbed two-inch diameter soil samples. The sampler was five feet long, allowing a continuous sample to be taken of that length. Two samplers were normally assigned to each rig so that drilling and sampling operations could be sustained, without interruption. The sampler was fitted with segmented brass liners, two-inches in diameter and two inches high, which after sampling, were separated using a piano wire saw (see T.E. Stanton, 1936, ***An Improved Type of Soil Sampler for Explorations of Soil Conditions and Soil Sampling Operations***, Proc 1st ICSMFE, Cambridge, v.1, p.13-15).

The two-inch sampler required power equipment and was originally developed for the recovery of undisturbed samples of clay for the San Francisco Oakland Bay Bridge project. Between 1933-36 more than 13,000 lineal feet of samples were taken from several hundred borings for the Bay Bridge, as well as other highway projects. These samplers were used to a maximum depth of 232 feet on the Bay Bridge. A larger sampler was also fabricated to recover four-inch diameter samples for situations that warranted larger diameter samples, usually to enable shear strength and consolidation testing.

The two and four-inch diameter samplers were employed by truck-mounted drilling rigs. For subaqueous sampling beneath San Francisco Bay, the drill rigs were tied to barges and steel well casings was inserted through the waters and driven 7 to 90 feet into the seafloor. The depth of penetration depended on the presence of running sands (ENR, June 4, 1936, p. 804-05). Brass caps were used to seal the individual sample segments upon recovery. The four-inch sampler required heavier equipment to operate, so was only used in situations that justified the additional cost.

During World War II Porter developed “all-in-one” truck-mounted drilling rigs with retractable masts and an array of Porter Samplers. These were intended to provide a more robust system of drilling and recovery of continuous soil samples for the Navy out in the Pacific, where they were having difficulties drilling through porous and cavernous coral, causing loss of drilling circulation. These rigs were equipped with three-foot long samplers, intended to recover continuous two-inch diameter samples using three-foot sampling rounds. The rigs could develop 20,000 pounds normal orce to aid sampling at depth. After the war (1946-47) Porter developed even heavier truck-mounted drilling rigs that could exert pressures of up to 30,000 pounds up or down, which doubled as exploration and foundation drilling rigs, which could be used to drill large diameter caissons (see O.J. Porter, ***Taking Soil Samples by the Soil Tube Method*** in November 1947 issue of *Roads & Bridges*).

In the mid-1950s Porter began marketing a 3-inch diameter sampler capable of recovering 2.5-inch diameter samples, which could be used with either 6-inch, 2-inch, or 1-inch high brass rings. This was intended to compete with the Modified California Sampler developed by Dames & Moore, described later.

**Structural Engineer title act (1932)**

In September 1932 the California Board of Registration for Civil Engineers begin granting the special title “**structural engineer**” (S.E.), which required applicants to demonstrate three to five years of responsible charge of structural engineering projects to be eligible to sit for a special examination. But, those individuals who could document more than five years of experience in “responsible charge” were duly grandfathered into the title. The first SE exam wasn’t offered until several years later, in 1934.

In March 1933 the Long Beach earthquake killed 115 people and caused $50 million in damage, mostly to unreinforced masonry structures, such as public school buildings. Within a month of the quake, the California Legislature passed the **Field Act** (described below), which empowered the Office of the State Architect to undertake whatever measures it deemed appropriate to ensure safe design and construction of public school buildings, which included requirements for plans prepared by a certified architect or structural engineer and set requirements for lateral earthquake loads, which depended on location. The Field Act left a lasting imprint on how structural engineers would be qualified in California; requiring them to demonstrate an understanding of analyses, designs, and consultations involving structural engineering principles associated with the application of seismic loads.

A companion legislation, christened the **Riley Act** (described below) was also enacted in 1933. It required local agencies in California to establish their own building and inspection departments (the first Uniform Building Code had appeared in 1927, but only a handful of the state’s largest cities had adopted it). The Riley Act also required all new construction to be designed to withstand an earthquake acceleration of at least 0.02g, but also allowing municipalities the discretion to employ even higher values, as they deemed appropriate. Much of this legislation was influenced by the efforts of the Seismological Society of America, which advanced the inclusion of seismic loads in the building codes of California (and succeeded in convincing Palo Alto and Santa Barbara or instituting such measures in the mid-1920s).

**National Council of State Boards of Engineering Examiners (1932)**

In October 1932 a National Council of State Boards of Engineering Examiners (NCSBEE) was endorsed at a meeting in New York of the National Bureau of Engineering Registration (NBER), headquartered in Columbia, South Carolina. NCSBEE sought to create standardized civil engineering registration examinations and requirements so reciprocity of licenses between the 28 states mandating professional registration could be undertaken more efficiently. In 1967 NCSBEE changed its name to the National Council of Engineering Examiners (NCEE). NCEE developed standardized tests which were gradually adopted by most states, beginning in the 1960s. NCEE broadened its scope to include establishment of a ***Model Rule for Professional Conduct*** in 1979, which many courts have considered as national standards for professional engineering conduct. In 1989 NCEE became the National Council of Examiners for Engineering & Surveying (NCEES). Its headquarters remains in South Carolina (at Clemson).

California remained unaligned with the national examination concept until 1975, when they acquiesced to the standardized NCEE examination, which they have since employed. The reason the California board gave for this reticence was the “eastern bias” they perceived in the NCSBEE/NCEE exams, which had less emphasis on transportation engineering problems, as compared to California’s exams.

**First use of wick drains in California (1933)**

 **O. James “Pappy” Porter** was also the moving force behind the development of **sand wick drains**, which were initially employed on the fill approaches to the San Francisco-Oakland Bay Bridge in 1933-36. These are generally regarded as the first successful employment of wick drains in the USA [Porter, O.J., 1936, Studies of fill construction over mud flats including a description of experimental construction using vertical sand drains to hasten stabilization: *Proc. Int’l Conf Soil Mech & Fdn Eng*, Cambridge, MA, Vol. 1, pp. 229-235]. One of the higher visibility projects Porter employed sand drains for a railroad relocation around Chicago’s O’Hare Field, in 1947-48, which was very successful. **George Bertram** (MSCE ’39 Harvard) and **Reginald A. Barron** of the U.S. Army Corps of Engineers went on to perfect the art of sand drains, building on the pioneering work of Porter in the 1930s and 40s.

**Passage of the Riley and Field Acts (1933)**

 Two significant pieces of legislation came out of the March 10, 1933 M6.3 Long Beach earthquake. Within 30 days of the quake the State legislature passed the **Field Act**, named after California Assemblyman **Charles Field**, the key sponsor of the legislation. His bill focused on making publicschool buildings in California more earthquake resistant (all K-12 and community college school buildings). It was also the first statewide legislation that mandated earthquake resistant construction in the [United States](http://en.wikipedia.org/wiki/United_States). The quake destroyed or rendered unsafe 230 school buildings in Southern California because these were constructed of unreinforced masonry. Fortunately, the quake occurred at 5:55 PM on a Friday, after most everyone had gone home, and thousands of children’s lives were thereby spared.

 The Field Act was introduced with the Riley Act, which together, all but banned [unreinforced masonry construction](http://en.wikipedia.org/w/index.php?title=Unreinforced_masonry_construction&action=edit&redlink=1), requiring that earthquake forces be included in the design of new structure, and all existing public schools. This included a requirement for base shear calculations, and that school buildings must be able to withstand [lateral forces](http://en.wikipedia.org/w/index.php?title=Lateral_forces&action=edit&redlink=1) equal to at least 3% of the building total mass. The Act also established the Office of the State Architect (now [Division of the State Architect](http://en.wikipedia.org/wiki/Division_of_the_State_Architect) or DSA) which developed design standards, quality control procedures, and required that schools be designed by registered [architects](http://en.wikipedia.org/wiki/Architects) and [engineers](http://en.wikipedia.org/wiki/Engineers). These professionals are required to submit their plans to the State Architect for review and approval prior to construction. The same professionals were also required by the Act to periodically inspect the construction while underway and verify that the actual work completed is in compliance with the approved drawings. Peer review was also introduced as another quality control procedure.

 The other significant legislation that came out of the March 1933 Long Beach earthquake was the **Riley Act**, which required all cities and counties in California to establish departments to regulate building construction. Roughly 10 to 15 percent of California’s present structures were built prior to 1933, when few cities had building codes (the Uniform Building Code was introduced in 1927, but was only adopted by a few of the larger municipalities, such as the City of Los Angeles). The Riley Act required local jurisdictions to establish building and safety departments and inspect new construction, mandating that all structures in the state be designed to withstand a horizontal acceleration of 0.02g. These requirements applied only to new structures, and California municipalities could add to the Riley Act requirements at their own discretion. The Riley Act has exerted an enormous impact on California because structures built since 1933 have been constructed with some minimal measure of lateral reinforcement and load transfer elements within the framing, and later, between the framing and the foundations. Since the 1960s, California codes have become more uniform across local jurisdictions. The Riley Act includes exemptions for wood frame structures of two stories or less, as well as bi-plexes and single-family residences of all construction in unincorporated areas (only one person was killed inside a single-story wood frame dwelling by any California earthquake during the 20th Century). However, many counties enhance their requirements for such buildings beyond these statewide minimums.

**Adoption of seismic loads recommended by the UBC (1933)**

Following the March 1933 Long Beach Earthquake, the State of California required every municipality to adopt a building code (under the Riley Act, described above). 114 California municipalities adopted the 1933 Edition of the UBC, including most of the larger cities in southern California. Prior to 1933 only Palo Alto and Santa Barbara had adopted more restrictive codes for seismic loading.

Due to the poor performance of unreinforced masonry structures during the Long Beach earthquake, the 1933 UBC required all school of two stories or more in height to be built of reinforced concrete or structural steel frame construction. Single story schools were required to have fire-resistant walls and floors, and fire-retarding roofs. All public buildings, including schools, were required to provide for lateral forces from earthquake motion, and the use of lime mortar was altogether outlawed.

School districts and local municipalities complained, but a vigorous program of retrofit and school reconstruction, as well as new construction, soon ensued, providing work for architects, structural engineers, and contactors. It also bolstered the prestige and respect of licensed structural engineers, and their organizations, such as SEAOSC and SEAOCC. San Francisco adopted their own more restrictive version of this code in 1948 (described below), based on input from the Structural Engineers Association of Central California.

**U.S. Soil Conservation Service established (1933-35)**

In June 1933 Congress passed the National Industrial Recovery Act, which included appropriations to combat agricultural soil erosion. This action was prompted by ‘The Dust Bowl’ conditions brought on by extended drought conditions in the Southwestern and Midwestern states. In September 1933 the federal **Soil Erosion Service** (SES) was established within the Department of Interior with **Hugh H. Bennett** as its Chief. Bennett had formerly served as a surveyor with the old U.S. Bureau of Soils. The SES established demonstration projects in critically eroded areas across the country to publicize the benefits of soil conservation.

In April 1935 Congress passed Public Law 74-46, which established the **Soil Conservation Service** (SCS) as a permanent agency within the U.S. Department of Agriculture, again under the direction ofBennett. In 1929 Bennett wrote a book titled “***Soil Erosion: A National Menace***,” which influenced the decision to establish federal soil erosion experiment stations in 1929.

Bennett instituted a seven-fold increase in demonstration projects for local farmers and SCS began publishing County-wide report “separates,” which included color overlays on then-existing USGS 15-minute (1:62,500 scale) topographic map mosaics. One example would be: E.J. Carpenter and S.W. Cosby, 1939, *Soil Survey, Contra Costa County, California*: USDA Bureau of Chemistry and Soils, Series 1933, No. 26. A check of this original map not only reveals the soil assignments, but in most instances, also provides an assessment of the undeveloped topography. These were usually prepared by local soil scientists attached to the SCS or in cooperation with the U.C. Agricultural Experiment Stations.

In the late 1930s SCS set about developing more reliable and scientifically-based maps of soil deposits with extensive compendiums of soils properties. In 1920 Professor **Curtis F. Marbut** of the University of Missouri began developing an agricultural [soils classification](http://en.wikipedia.org/wiki/Soil_classification) scheme. In 1927 he translated Glinka's *The Great Soil Groups of the World and their Development* from German. His classification scheme was unveiled in the *1938 Yearbook of Agriculture, Soils and Men*: the [1938 USDA soil taxonomy](http://en.wikipedia.org/wiki/1938_USDA_soil_taxonomy). He divided soils into [pedocals](http://en.wikipedia.org/wiki/Pedocal) (carbonate rich soils in the drier climates) and [pedalfers](http://en.wikipedia.org/wiki/Pedalfer) (soils developed in more humid climes and rich in aluminum and iron. Alfer became the root term for [Alfisols](http://en.wikipedia.org/wiki/Alfisols). This new scheme met with mixed success.

The decade following the Second World War saw Congress increased appropriations for soil conservation programs. Between 1945-48 a new classification system was developed, culminating with the “7th approximation,“ introduced in 1960, which became the national standard in 1965. This was tweaked slightly to include 10 distinct soil orders in 1975, and expanded to include 12 soil orders in 1999. These details are included here to make the reader aware that soil surveys performed in different decades use differing descriptive terms. In 1994 the name of the agency was changed to the **Natural Resources and Conservation Service** (NRCS).

**National Society of Professional Engineers (1934)**

The **National Society of Professional** [**Engineers**](http://en.wikipedia.org/wiki/Engineers) (**NSPE**) was founded in New York City in 1934 as the national society of engineering professionals from all disciplines, which promotes the ethical and competent practice of engineering, professional licensure, and enhances the image and well-being of the professional of engineering. NSPE established the celebration of [National Engineers Week](http://en.wikipedia.org/wiki/National_Engineers_Week_%28U.S.%29) in 1951, in conjunction with President [George Washington](http://en.wikipedia.org/wiki/George_Washington)'s birthday (February 22nd). President Washington is considered as the nation's first engineer, notably for his survey work in the Ohio Valley. NSPE has worked with ASCE to establish uniform standards for professional engineering of civil engineers in all 50 states and territories of the United States, which went into effect in 2003. NSPE now serves more than 54,000 members and the public through 53 state and territorial societies and more than 500 chapters.

**Soil mechanics laboratory protocols established by the Army Corps of Engineers (1934)**

 **Theodore “Ted” T. Knappen** (1900-1951) was a 1917 graduate of Berkeley High School and attended Cal Berkeley as a civil engineering student in 1917-18, before receiving an appointment to West Point. In 1920 he received a commission in the Corps of Engineers and was sent to Rensselaer Polytechnic Institute to complete his MSCE in 1922.

 In 1923 he began a notable civilian career working on projects in California until the Great Flood of 1927 on the Mississippi River, when he was hired by the Corps of Engineers Memphis District in a supervisory civil service position. In 1934, Knappen assumed the position of Chief of the Engineering Division for the Corps of Engineers Muskingum Valley Flood Control Project in eastern Ohio. Knappen and **Robert R. Philippe** established the ***Corps of Engineers’ first soil mechanics laboratory***, which Philippe directed. These activitries were summarized in four articles that appeared in *Engineering News Record* under the titles:”***Practical Soil Mechanics at Muskungum****-Parts I thru IV,*” which appeared on March 26, April 9, April 23, and May 7, 1936.

 In 1942 Knappen started his own firm Theodore Knappen & Associates in New York City. A few years after his untimely death in 1951, the senior principal partners renamed the firm Tippetts-Abbett-McCarthy-Stratton, which came to be known by the acronym TAMS.

**Downhole Logging of Large Diameter Borings (1935 – onward)**

 Around 1935 consulting foundation engineer **R. V. Lebarre**, PE, SE (1871-1944) of Los Angeles began excavating vertical shafts between two and three feet in diameter with a mobile power auger (described in “***Test Pit Exploration Kit for Foundation Study***” in the August 6, 1936 issue of *Engineering News Record*). These borings were of sufficient size and depth (60 to 70 ft deep) to allow a geologist to descend the unshored holes for purposes of evaluating the geologic conditions and making measurements and taking soil or rock samples. These men also used soil penetrometers to record soil stiffness with depth, creating detailed subsurface logs.

 The art of downhole logging was lost when Lebarre died in 1944, but was revived in the early 1960s by **F. Beach Leighton**, PhD, CEG and **Robert Stone**, PhD, CEG in the Los Angeles area, who used the same techniques, but with flexible Boatswain’s Mate rope ladders, which Leighton had used in the late 1940s to descend into glacier crevasses in Alaska. Two excellent articles describing the use of using bucket augers have been published: C.M. Scullin, 1994, “***Subsurface exploration using bucket auger borings and down-hole geologic inspection,***” AEG Bulletin v. 31:91-105; and P.L. Johnson and W.F. Cole, 2001, “***The use of large-diameter boreholes and downhole logging methods in landslide investigations***,” Engineering Geology Practice in Northern California, CDMG Bulletin 21-/AEG Spec Pub 12, pp. 95-106. No one has ever been killed while performing downhole logging, although Frank Dennison lost one of his legs after passing out and having to be dragged up out of the hole, at a site in the Los Angeles area.

**Soil Mechanics & Foundations Division of ASCE (1936)**

At the annual ASCE meeting in July 1936 the society’s Board approved the formation of a new **Soil Mechanics & Foundations Division** from the **Committee on Earths and Foundations** (established in 1929). The first Executive Committee of the new division was comprised of: W.P. Creager of Buffalo, Carlton S. Proctor of New York City, J. F. Coleman of New Orleans, Frank A, Marston of Boston, and **R.V. Labarre** of Los Angeles. Proctor served as the first Chairman and **Theodore T. Knappen** of the Army Corps of Engineers, as the division’s first secretary.

**Geological Map of California (1938-onward)**

In 1938 the State Division of Mines and Mining released their initial six-sheet ***Geologic Map of California*** (edited by Olaf P. Jenkins, Chief Geologist of the Division of Mines) at a scale of 1:500,000 (about an inch to 8 miles). The sheets took nine years to compile and showed about one-quarter of the state’s land are to be unmapped, including the Klamath Mountains, the northern Coast Ranges, the southern Sierra Nevada, and the desert areas of southeastern California. Much of this early work was carried out by field geology courses taught by Berkeley, Stanford, Caltech, and UCLA each summer. These maps were out-of-print by 1952. The first-generation maps were superseded by more detailed *Geologic Atlas of California* at 1:250,000 scale (1 inch = 4 miles) geologic map sheets released by the California Division of Mines & Geology (after a name change in 1961), between 1958-66 (described below). DMG also released a 1:750,000 scale State Geology Map in 1977, which was reprinted in 1991 (small enough to be mounted on a classroom wall). More recent interpretations have subsequently been in release since 1982 and continue to the present. This series of maps covers all of California and is considered basic information that would be cited in any engineering geologic study.

**Government sponsored aerial mapping of California (1938-40)**

Between 1938-40 the U.S. Soil Conservation Service (SCS) contracted for all of California to be photographed with black and white stereopair aerial images. Soils data for each county were usually plotted directly upon large prints of these photos (described in W.C. Lowdermilk’s article *Use of Aerial Mapping in Soil Conservation,* in *Civil Engineering*, v.8:9, September 1938, pp. 605-07). After 1945 soil designations were then represented spatially on black-and-white photo mosaics. These post-1940 SCS reports contain soils information of reliable accuracy.

**First use of drilled horizointal drains [hydraugers] (1939)**

 Hydarugers, or horizontal drains, were first employed in 1939 by the The California Division of Highways, described in “***Horizontal Drains on California Highways***” by **T.W. Smith** and **G.V. Stafford** in the July 1957 ASCE Journal of the Soil Mechanics and Foundations Division. Similar concepts were developed in 1940 by **Earl M. Buckingham**, PE(1902-97), Supervising Civil Engineer for Oakland, working with the **Ransome Construction Company** (est by E.L. Ransome in 1870, and still operating out of San Leandro), the first private venture to employ similar technology. Ransome developed a drilling machine that utilized a reversible air motor with a hollow crankshaft which delivered water to the rotating cutting bit through a string of hollow rods. They were often used in combination with vertical relief wells, as part of slope stabilization schemes. Some of the early stabilization projects included the McKillop Road (1935) and Simmons Street Landslides (1940), the Barrows-Holman Roads Slide (1942), and Underhills Road slide (1943) in the City of Oakland (described in the discussions of Hyde Forbes’ 1946 article ***Landslide Investigation and Correction*** (cited below) and in Earl Buckingham’s 1962 article ***Investigation and Correction of Landslides***, a chapter in ***Field Testing of Soils***, ASTM STP 322, pp. 159-165.

 The original approach was to use modified fishtail bits drilling 4-inch diameter holes, within which would be inserted 2-inch diameter steel pipe with 3/8th-inch diameter perforations. The perforated casing came in lengths between 16 and 24 feet. In 1949 the industry began shifting to the use of rock roller bits used in the petroleum industry because these were readily available in a large variety of diameters. The industry came to call horizontal drains “***hydraugers***,” a moniker subsequently adopted by most agencies that employ them.

**Adoption of the Standard Proctor Compaction test by AASHO (1939) and ASTM (1942)**

The Standard Proctor Compaction Test was adopted with slight modifications by the American Association of State Highway Officials (AASHO) as the ***Impact Compaction******Test*** and assigned **Test Designation T-99** in 1939. The Modified Proctor Compaction Test was designed as AASHO Test Designation T-180 in 1946 (described below).

 In 1942 the American Society for Testing and Materials (ASTM) approved the same procedure as their “***Tentative Methods of Test for Moisture-Density Relations of Soils***” as ASTM **Test Standard D 698** in 1942. This procedure assumed a compactive effort derived from dropping a 5.5 lb weight from a height of 12 inches, engendering a compactive effort of 12,400 ft-lbs input energy per cubic foot of soil. In June 1957 ASTM approved revisions that introduced Methods A, B, C, and D to the standard. Methods B and D allowed the use of 6-inch diameter molds, while Methods C and D allowed the inclusion of particles up to ¾-inches in diameter. The D 698 test procedures were also revised in Oct 1978 (introduced option for 25 or 56 blows), Nov 1991 (manual versus mechanical rammers), and January 1997 (correction of Eqn 1 to ascertain dry unit weight).

**Early textbooks on soil mechanics in English: Plummer and Dore (1940); Krynine (1941) and Terzaghi (1943)**

 **Fred L. Plummer**, Chief Research Engineer for the Hammond Iron Works in Warren, PA, and **Stanley M. Dore**, Assistant Chief Engineer for the Metropolitan District Water Supply Commission of Massachusetts, co-authored the first textbook in English on soil mechanics in the United States. “***Soil Mechanics and Foundations***” was released by the Pittman Publishing Corporation in 1940. This text was used in many eastern colleges during the early 1940s, including The Citadel. It included a comprehensive overview of embankment dam engineering practice in the United States up to that time.

 In 1941 **Dimitri P. Krynine** (1877-1967), Research Associate in Soil Mechanics at Yale University, published a textbook in English titled “***Soil Mechanics****,”* released by McGraw-Hill Book Co. Krynine had immigrated to the United States from Russia in February 1930 and became a naturalized American citizen in September 1935. This text went through 11 printings and was used extensively in the training of both Navy and Army combat engineering officers during the Second World War. Krynine became a Lecturer in Civil Engineering at Yale and released a Second Edition of the textbook in 1947. In 1957 he and William R. Judd of the Bureau of Reclamation co-authored the text ***Principles of Engineering Geology and Geotechnics***, also published by McGraw-Hill. Krynine retired from Yale in 1947 and moved to Alameda (his son Paul Dimitri Krynine had attended Cal Berkeley in the late 1920s and was a Professor of Geology at Yale and Penn State). Krynine served as a consultant to Woodward Clyde in Oakland and as a lecturer for Cal Berkeley until he passed away in 1967, at the age of 90.

 In early 1934 Professor **Karl Terzaghi** (1883-1963) at the Technical University in Vienna began preparing the manuscript of a new textbook on soil mechanics in English. This was in anticipation of his involvement in the First International Conference on Soil Mechanics and Foundation Engineering held at Cambridge, MA in June 1936. Terzaghi had hoped this would open up opportunities for him to return to the United States as a professor, but the Great Depression prevented any serious offers. He returned to the United States in September 1938 and was given the title of Lecturer in Engineering Geology at Harvard. He continued working on his book manuscript, assisted by a post-graduate student named **Ralph Peck**, who checked Terzaghi’s English and drafted many of the ink figures. This collaboration resulted in the release of Terzaghi’s first book in English, titled “***Theoretical Soil Mechanics***, released by John Wiley & Sons in 1943, during the Second World War. It quickly became one of the longest selling titles in John Wiley’s line of textbooks, which remained in-print until 1967.

**Army Corps of Engineers Airfield Pavement Design Advisory Council (1942-45)**

In June 1941 the Los Angeles District of the U.S. Army Corps of Engineers began wrestling with pavement bearing failures beneath the massive 96-inch diameter tires of the new Douglas B-19 bomber, which weighed 162,000 lbs., spread on just three wheels. The aircraft had caused pavement distress at Clover Field in Santa Monica (where it was built) and at March Army Airfield in Riverside (where it was officially delivered to the Army Air Corps).

District engineers in Los Angeles quickly consulted with research engineers at the Corps’ Waterways Experiment Station in Vicksburg, MS and it was agreed that an Airfield Pavement Design Advisory Council should be formed, centered around **O. James Porter** (formerly of the California Division of Highways in Sacramento) because of his pioneering role in developing the California Bearing Ratio Test in 1928 (described previously). The advisory council was comprised of Colonel **Henry C. Wolfe** (who had worked on the Fort Peck Dam soil mechanics problems), structures Professor **Harald M. Westergaard** of Harvard, and Dr. **Philip C. Rutledge** of Moran, Proctor, Freeman & Meuser, soil mechanics Professor **Arthur Casagrande** of Harvard, **Thomas A. Middlebrooks** (the Corps senior expert in soil mechanics, who had also worked on the Fort Peck Dam landslide), **James L. Land** of the Alabama State Highway Department, and **O. James Porter** of O.J. Porter & Co. in Sacramento.

Through Porter’s urging the advisory council selected the “Stockton Test Track” at the Air Corps’ Stockton Field, about 60 miles south of Sacramento, for the most ambitious field pavement test program ever devised, up to that time. The tests employed various pneumatic rollers, up to 240,000 lb passing over pavement sections of varying thickness, stiffness, and consistency, to better evaluate the California Bearing Ratio (CBR) test results for individual wheel loads up to 150,000 pounds. This work was summarized in R.A. Freeman and O.J. Proctor, 1946, ***Flexible Pavement Test Section for 300,000-LB. Airplanes, Stockton, California***, Proc 25th Mtg Highway Research Board (Oklahoma City), National Research Council, Wash., DC, pp.23-44.

From these tests, the Army Corps of Engineers developed specialized design procedures for flexible asphalt runways that incorporated the properties of the pavement subgrade, because the aircraft wheel loads are transmitted directly to the subgrade in flexible pavements. This focused attention on the importance of *subgrade compaction*, leading to the **Modified Proctor Compaction Test** of 1946 (described below). These design procedures were subsequently incorporated into post-war design of flexible asphalt highway pavements, which were used in the **Interstate & Defense Highway Program**, beginning in 1955.

**Engineering Geology Branch of the U.S. Geological Survey (1945-84)**

 In the fall of 1945 the U.S. Geological Survey’s Geologic Branch was divided into two groups of sections, economic geology and the other basic and engineering sciences. Included were sections for new specialities in foreign geology, engineering geology, military geology, and geophysics. In 1945 an **Engineering Geology Branch** was established under the direction of **Edwin B. Eckel**, who led the group until 1961. The new branch aided in bridging the gap separating engineers and geologists. There was a lack of knowledge—geological as well as engineering—of the mechanics, recognition, and control of landslides; there was little understanding on the part of geologists about facts and observations needed on maps for use by engineers, and engineers did not appreciate how geologic maps could provide background data for their work. Eckel brought the two disciplines closer together. Among the landslide investigations undertaken while he was chief of the Branch were those in reservoir areas (Lake Roosevelt and Ft. Randall Reservoir), in coastal areas (Pacific Palisades, Martha’s Vineyard), in urban settings (La Paz, Anchorage, Los Angeles, San Francisco Bay area, several Chilean cities, Rapid City), and in a variety of mountainous areas (southwest Colorado, east-central Utah, Jackson Hole, and the Colorado Front Range). These studies added to our knowledge of this socially and economically important geologic process.

 In 1961 **David J. Varnes** became the second Branch Chief, serving until 1964. In 1963 the Geologic Division of the USGS was reorganized into four units: Engineering Geology, Regional Geology, Economic Geology, and Experimental Geology. **John “Jack” T. McGill** served as Branch Chief from 1969-74, and was succeeded by **Robert L. Schuster** (1974-79). The last Branch Chief was **Donald R. Nichols**. In 1984 the branch was initially absorbed into the USGS National Earthquake Information Center in Denver, and re-organized or renamed three times after that.

**Adoption of the Modified Proctor Compaction Test (1946 to 1985)**

In 1938-40 Thomas E. Stanton (BSCE 1904 Berkeley) of the California Division of Highways wrote two important papers on mechanical compaction of soil embankments: “***Compaction of Earth Embankments***” for the Proceedings of the Highway Research Board in 1938, and “***Methods of Controlling Compaction in Embankments****,*“ for the Proceedings of the 1940 AASHO Meeting in Seattle. In the second article he describes a “***Modified Proctor Test***,” which sought to “*obtain higher compacted densities and thus a lower optimum moisture content*” than that employed in the “Standard Proctor Test.” Given the fact that Stanton was O.J. “Pappy” Porter’s supervisor, the description of compaction test employing considerably more input energy was therein coined formally in 1946 by Porter as the “modified Proctor basis” of 1946 (see “***Soil Compaction for Airports***” in *Engineering News Record*, March 21, 1946, p.82-86).

The “modified Proctor basis” was formally endorsed by the Embankment, Foundation, and Pavement Division of the Corps of Engineers Waterways Experiment Station in Vicksburg in 1946 as a “dynamic compaction test,” using the same sort of impact hammer suggested by Proctor in 1933. This was based on input from their **Airfield Pavement Design Advisory Council**, described above. It employed the same cylindrical mold as the Standard Proctor test (4 inches in diameter and 4.6 inches high, with a removable mold collar 2.5 in. high). The mold volume is 1/30th cubic foot, but it employs a heavier 10-pound hammer, 2 inches in diameter, which is allowed to free-fall 18 inches onto the soil (15 ft-lbs per blow). The soil mixture is compacted in five lifts, with an average thickness of 0.80 inches/lift. 25 blows were exerted per lift, which equals 25 x 15 = 375 ft-lbs per lift. The total input energy for the five lifts is 5 x 375 = 1875 ft-lbs on a soil sample with a volume of 1/30th cubic foot. This equals 56,250 ft-lbs of compactive energy per cubic foot of soil, about 450% more energy than the Standard Proctor procedure.

By 1950 the Corps of Engineers issued reports which suggested that cohesionless soils (e.g. aggregate subbase and aggregate baserock) should be compacted “in a saturated state with the modified AASHO compactive effort” (see Waterways Experiment Station,” Soil Compaction Investigation Report No 5, “Miscellaneous Laboratory Tests,” *Technical Memorandum No. 3-271*, Vicksburg, June 1950). The new test was designated as Modified AASHTO T180 (adopted in 1946), while the ASTM Test Standard D 1557 was not adopted until 1958. Though originally developed for airfield runways and pavement subgrades, the Modified Proctor Test become the national standard by 1985, when UBC Test 70-1 (33,800 ft-lbs/ft3 input energy) was discarded by the UBC Appendix Chapter 70, in favor of ASTM D 1557 Modified Proctor Compaction Test.

**Landslide Investigation and Correction (1946)**

In the February 1946 ASCE Proceedings San Francisco engineer and geologist **J. Hyde Forbes** (1889-1961) published an award-winning article titled “***Landslide Investigation and Correction***,” which appeared in the 1947 *ASCE Transactions* and was recognized by the James Laurie Prize of ASCE for 1948. This article and the accompanying discussions included some excellent examples of multi-faceted landslide repairs, using fill buttresses, different types of subdrains, hydraugers advanced from subterranean “drainage pits,” etc.

**USGS 7.5-minute quadrangles (1947-95)**

 Shortly after the Second World War the USGS began to photograph all of the continental United

States to develop 7.5-minute (1:24,000 scale) maps of urban areas and complete their 15-minute (1:62,500 scale) of mountainous and/or uninhabited areas, using orthophoto-derived techniques (most commonly, Zeiss Stereoscopes). These photos were imaged between 1946-49, and the initial series of 7.5-minute maps were released between 1947-59. Less inhabited regions, such as the Diablo Range, were covered by the larger scale 15-minute maps.

 In 1956 the USGS began imaging a second series of aerial photos across California, part of a program then envisioned library photography on 10-year intervals. A second series of 7.5-minute maps began to be released, beginning in 1959, based on this new imagery. These second-generation maps were only produced in areas where urban growth was rapidly expanding, such as the San Francisco Bay area. These maps were released between 1956-79. Contour intervals were generally 20 or 40 feet on the 7.5-minute series maps, and 40 or 80 vertical feet on the 15-minute series.

In the early 1970s the USGS committed to mapping all of California on 7.5 minute 1:24,000 scale maps, and this program was completed around 1987. Digital map overlays were often provided for areas of large urban growth by using gray shadowing, without benefit of replicating the newly created topography. These overlay updates are electronically generated from space-based imagery. Funding for USGS mapping activities was severely curtailed during the 94th Congress in 1995, and no new topographic map products are currently contemplated other than shadow overlays delineating newly developed areas. In 1996 Wildflower Productions began releasing USGS 7.5 min. topographic maps in electronic format. The USGS maps remain an important source of information, especially for those areas graded for agriculture or urban development, where old channels, escarpments, debris fans, terraces and landslide features have been all but obscured by man.

**Engineering Geology Division of GSA (1947)**

 The **Engineering Geology Division** (EGD) of the Geological Society of America was established as the society’s first specialty division in 1947, in contrast to the Society’s established geographic sections. This came about because of the widespread use and organization of engineering geologists and military geologists by federal agencies during the Second World War (1939-45). Prof. **Charles P. Berkey** of Columbia University served as the division’s first chairman, **Sidney Paige** as vice-chairman, and **Roger Rhoades**, secretary. Other geologists who figured prominently in the establishment of the new division included: A**rthur B. Cleaves**, **Parker D. Trask**, **Edward Burwe**ll, **William Irwin**, **Shailer Philbrick**, and **George Woollard**.

 In 1951 one of the earliest definitions of "Engineering Geologist" or "Professional Engineering Geologist" was provided by the Executive Committee of the EGD, as follows:

“A professional engineering geologist is a person who, by reason of his special knowledge of the geological sciences and the principles and methods of engineering analysis and design acquired by professional education or practical experience, is qualified to apply such special knowledge for the purpose of rendering professional services or accomplishing creative work such as consultation, investigation, planning, design or supervision of construction for the purpose of assuring that the geologic elements affecting the structures, works or projects are adequately treated by the responsible engineer.”

These concepts and definitions were absorbed into the certifications by the City of Los Angeles (1958), Los Angeles County (1960), Orange County (1962), AIPG (1963), and the State of California (1969), described below.

The EGD began publishing a quarterly newsletter titled ***The Engineering Geologist*** in April 1966, with Prof. **Dick Goodman** at Berkeley serving as the first editor. The division was re-named the **Environmental & Engineering Geology Division** of GSA in 2011, to better reflect the evolving focus of applied geology in the 21st Century.

**SEAOCC (1947) and San Francisco Building Code (1948)**

Following the 1933 Long Beach Earthquake, a group in the Structural Engineers Association of Southern California developed the first seismic provisions to be put into practice which was published in the 1943 Los Angeles Building Code. The year 1947 marked the formation of the **Structural Engineers Association of Central California**, SEAOCC (now SEAONC).

Shortly thereafter this organization became part of the state association and was able to lend its support to the efforts of the northern and southern associations. In 1948, the **San Francisco Building Code** (SFBC) was published and became known as the ‘Vensano Code,’ after Harry Vensano, the Director of Public Works in San Francisco. This code was the first in Northern California to include provisions for seismic design of buildings. Following the 1948 SFBC, a joint group of ASCE and the **Structural Engineers Association of Northern California** (SEANC) joined to develop a seismic design document which became published as ASCE Separate 66 in 1951.

**Adoption of Title 21 and the requirement for compaction testing on public works projects (1950)**

In 1950 California Administrative Code Title 21 (Public Works: Department of Public Works, Architecture, Highways, Toll Bridge Authority) was enacted by the California Legislature. This required government agencies to require materials testing for public buildings, streets, and trench backfill of buried utilities in streets. These new requirements included compaction testing of soils, which hastened the inclusion of soils testing capabilities by various firms in the San Francisco Bay Area, such as: Abbot A. Hanks, Inc. of San Francisco (established in 1886), Smith-Emery Co. of San Francisco (established in 1904), the Hersey Inspection Bureau of Oakland (founded in 1946), and Testing and Controls of Mountain View (founded in 1954).

**GSA-ASCE Joint Committee on Engineering Geology (1950-86)**

 The GSA-ASCE Joint Committee on Engineering Geology was established in July 1950 by a memo from **William R. Judd**, CEG of the Engineering Geology Branch of the Chief Engineers’ office at the U.S. Bureau of Reclamation in Denver, addressed to the Engineering Geology Branch of GSA and the Soil Mechanics and Foundations Division of ASCE. The committee was formed “to deal with all of the problems pertinent to engineering geology, contributing to better understanding and communication between geologists and engineers.” From 1950-68 Judd served as the committee secretary, before joining the faculty at Purdue University in 1966.

**Adoption of National Map showing Zones of Seismic Probability (1955)**

 During the 28th annual meeting of the Pacific Coast Building Officials Conference in 1950, it was moved to adopt a map of the United States showing zones of approximately equal seismic probability, compiled by the U.S. Coast & Geodetic Survey. This was eventually adopted in the 1955 Edition of the Uniform Building Code (UBC) of the Pacific Coast. California was divided into three zones: 1 – minor damage; 2 – moderate damage; and 3- major damage. The black dots on the map indicated the locations of historic earthquakes with shaking intensities between 7 and 10. At that time, the three largest events were the New Madrid earthquakes of 1811-12; the Owens Valley earthquake of 1872, and the 1906 San Francisco earthquake.



**Adoption of Excavation & Grading Ordinances in the Bay Area (1956-65)**

Influenced by the excavation and grading ordinances adopted in Los Angeles County between 1952-56, in 1956 the City and County of San Francisco adopted their own ordinance. They were followed by Alameda County in 1958, Contra Costa County in 1960, Richmond in 1961, San Mateo and Monterey Counties in 1961, Santa Rosa, Walnut Creek, and Palo Alto in 1962, Sonoma County in 1964, and Santa Clara County in 1965. By the late 1960s a new awareness of landslides in the urban environment emerged, and the state-of-the-practice at that time was considerably influenced by Beach Leighton’s article *Landslides and Hillside Development*, which appeared in the 1966 AEG publication *Engineering Geology in Southern California*. App. Ch. 70 Excavation and Grading of the 1973 Uniform Building Code was adopted as the minimum standard for all California municipalities effective March 7, 1974.

**Federal Housing Administration Land Planning Bulletin No. 3 (1956)**

In 1956 the Federal Housing Administration(FHA) issued **Land Planning Bulletin No. 3**, which set forth minimum standards for excavation and grading of residential subdivisions, including: inclinations of cut and fill slopes, requirements for mid-slope drainage terraces, and certification by soils engineers of 95% of Standard Proctor soil compaction. Developers seeking federal assistance had to comply with these standards and present soils & foundation engineering reports.

**USGS landslide mapping for FHA (1956-60)**

In the summer of 1956 the U.S. Geological Survey (USGS) began undertaking engineering geology studies in the San Francisco Bay Region. The early personnel included **Dorothy Radbruch**, CEG (1920-), **Manuel G. “Doc” Bonilla**, CEG (1920-2006)(BA Geol ’43 Berkeley), **Reuben Kachadoorian**, CEG (1921-83) (BS Geol ’51 Caltech; MS ’58 Stanford), **George Plafker**, CEG (BS Geol ’49 Brooklyn Col; MS Geol ’56 Berkeley; PhD ’72 Stanford), and **Fred Taylor**, RG (Kachadoorian and Plafker transferred to the Alaska Geology Branch after the 1964 Alaska Earthquake). One of the earliest products of this effort was a study funded by the Federal Housing Administration (FHA) for the proposed development of Warford Mesa in Orinda. This effort was summarized in a 1956 report by **Kachadoorian** titled ***Engineering Geology of the Warford Mesa Subdivision****,* USGS Open File Report. The 13-page report and detailed landslide map served as Kachadoorian’s master’s thesis in applied geology at Stanford. Doc Bonilla performed similar work in South San Francisco, but on an entire 15-minute quadrangle. This represented the first true reconnaissance-level attempt at landslide mapping, released as a USGS Open File report in 1960, titled ***Landslides in the San Francisco South Quadrangle, California***.

**Caltrans Handbook of Engineering Geology (1956)**

In 1956-57 the **California Division of Highways-Bridge Department Geology Section** under the leadership of **Ted L. Sommers**, CEG (a founding charter member of AEG) developed a 92-page handbook for engineering geologists and geotechnical engineers which contained a great deal of practical information to aid in subsurface evaluations of geologic conditions, such as field and lab classifications of soil and rock, SPT soil strength correlations, SPT versus CPT values with increasing depth, graphic standards for boring logs, estimations of fill and foundation settlements, pile load tests, and a rich bibliography. The ***Handbook Compiled by Engineering Geology Section Bridge Department - Incomplete and Unedited copy*** initially appeared in the spring of 1956 and was circulated widely prior to issuance of the first official volumes, in February 1958.

**California Association of Engineering Geologists (1957); Association of Engineering Geologists (1963); Association of Environmental & Engineering Geologists (2005-present)**

 In June 1957 13 engineering geologists met in Sacramento to discuss the formation of an organization or society specific to the emerging field of engineering geology. The founders were employees of the U.S. Geological Survey, U.S. Bureau of Reclamation, Army Corps of Engineers, California Department of Water Resources and Division of Highways, and two consultants (including **Ray Taber** of Moore & Taber). Over the next eight months they drafted the Constitution and Bylaws as the **California Association of Engineering Geologists** (CAEG), with three sections in Sacramento, **Los Angeles**, and San Francisco. CAEG vigorously promoted certification of engineering geologists in southern California (in Los Angeles, Orange, and Ventura Counties) and then professional registration of geologists in California (and later, nationwide).

 AEG was also the organization primarily responsible for the development of “modern” [second generation] grading and excavation codes, adopted in southern California in the early 1960s and by the International Conference of Building Officials for inclusion in the Uniform Building Code in 1964. As interest in affiliation spread beyond California, the prefix was dropped and it became the [national] **Association of Engineering Geologists**, or AEG, in January 1963, and was accepted as a member society in the American Geological Institute in 1964.

 In 1963 AEG began publishing a referred journal titled “*Bulletin of the Association of Engineering Geologists*,” released quarterly. Management of this journal was conjoined with the Geological Society of America in 1995 and the name changed to “*Environmental & Engineering Geoscience,*” released six times per year. In January 2005 members voted to change the name to the **Association of Environmental & Engineering Geologists** to better describe the geoenvironmental work many of its members specialized in. The new name was formally adopted in September 2005, although the organization still calls itself “AEG.”

**Consideration of an Association of Geological Engineers (1960-63)**

In 1960 Princeton University Professor John C. Maxwell proposed the formation of a separate Association of Geological Engineers in the United States. He received favorable replies from 13 of the 19 geological engineering departments then accredited by the Engineers Council for Professional Development (ECPD). Former GSA Engineering Geology Division Chairman Prof. Arthur B. Cleaves of Washington University hosted a meeting in St. Louis that summer, which was attended by seven of these schools. A central concern of the GE profs was that existing geological societies were not part of any organization like ECPD that would oversee curricula or standards of education, and professional registration in engineering. The 1960 meeting committee stated that ***“Geological Engineering is that branch of engineering concerned with the problems of analysis, design, and construction directly related to the earth, its materials, structures, and forces.”*** A follow up meeting was convened at the Colorado School of Mines in November 1960, during the GSA national convention. In 1961 GSA’s Engineering Geology Division formed a *Subcommittee on Relations with Geological Engineering*, chaired by Prof. Parker D. Trask of Cal Berkeley.

 In early 1962 the Geological Society of America’s Policy and Administration Committee urged the GSA Engineering Geology Division “to organize and establish a national grouping of engineering geologists by providing encouragement, advice, and assistance to establish an American Association of Engineering Geologists (AAEG).” This new group would then be invited to be an associated society of the Geological Society of America. An Advisory Committee was formed, comprised of Prof Allen F. Agnew (Univ South Dakota), Arthur Arnold of CAEG, E.B. Burwell of the Corps of Engineers, Bill Irwin of the Bureau of Reclamation, and Robert Legget the Canadian National Research Council.

 A series of articles were written by Robert T. Bean and published in *GeoTimes* in September and Nov-Dec 1962. The prevailing views expressed therein were that GSA’s Engineering Geology Division would continue to deal primarily with the scientific aspects of engineering geology, while the professional practice aspects of engineering geologists and the protection of public interest should logically be handled by a professional society, like the CAEG. This distinction was important because the licensing of engineering geologists could be expected to vary considerably, from state to state. The GSA committee recommended that engineering geologists and geological engineers be retained within one group, which set in motion the decision to change the organization to the Association of Engineering Geologists (AEG) on January 1, 1963.

 Geological engineers were allowed entrée to professional registration as civil (in all 50 states) or geological engineers (in Nevada and Arizona) because of their ECPD accreditation (subsequently assumed by ABET in 1980).

**USDA Soil Conservation Service county reports (1960-94)**

 Around 1960 the Soil Conservation Service (SCS) began publishing reports contain summaries of engineering properties for the mapped soils on aerial photo mosaics published at 1:24,000 (same scale as 7.5 min. quadrangles). The post-1960 SCS reports also contain tabulations of test data and engineering classifications, according to the American Association of State Highway Officials (AASHTO) and Unified Soil Classification System (USC) used by most consultants. The SCS has published and updated these reports from 1960 to present, though they are often out-of-print. In 1971 SCS issued their *Guide for Interpreting Engineering Uses of Soils* (USDA, Soil Conservation Service, Washington, D.C., 86 p.), which lays forth the rationale by which engineering classifications of soil are tabulated in the individual county reports they publish.

**American Institute of Professional Geologists (1963)**
 In 1956 Arizona became the first state to register geologists, in large measure because so many geologist were engaged in economic geology and mining. With that lone exception, geologists were not accountable with respect to public responsibility, regulation, and business practice, and no established guidelines or no national representation existed in behalf of those engaged in private practice. In 1963 a small group of geologists met in Golden, Colorado to compose the Constitution and Bylaws for the ***American Institute of Professional Geologists (AIPG)***, which was chartered on November 14, 1963 as a nonprofit corporation. Consulting petroleum geologist **Martin Van Couvering** of Los Angeles was elected the first President, and the institute’s headquarters was established at the Colorado School of Mines. Members who went through an established process of verifying their formal education and professional experience could qualify to use the title "**Certified Professional Geologists**," abbreviated by the letters "CPG" after their name. This was fairly common practice in California prior to the state’s adoption of a geologist registration act in 1969.

AIPG drew a significant number of its members from AEG, who were most concerned about geology registration (most consulting geologists in the mining and petroleum industries were ambivalent about professional registration). AIPG worked diligently to secure model registration acts in those states where a significant number of geologists worked I the private sector, usually working with the local organizations operating in those areas.

 AIPG become a national organization with a membership of nearly 850 by 1965, little more than a year after its founding. By 1974, AIPG had more than 2,000 members, and moved its headquarters to 622 Gardenia Court in Golden, where it remained for eight years. By the mid-1970s it had attracted a broad spectrum of geoscientists, including geophysicists, geochemists, and engineering geologists. In 1982 the AIPG headquarters moved to Arvada, Colorado. Today, AIPG has over 5,000 Members and Affiliates, which are organized into 36 sections.

**First Engineering Geology Lab Manual (1965)**

 In 1965 Professor Arthur H. Brownlow of Boston University and consulting geologist Mahlon J. Reinhard of Wichita, Kansas co-authored ***Laboratory Manual - Geology for Engineers***, published by W.C. Brown of Dubuque, Iowa. One of those who contributed significantly to the the manual’s review was Professor Thomas S. Beverage, Chairman of the geological engineering department at the Missouri School of Mines.

**Completion of Geologic Atlas of California (1966)**

 In 1951 the State Mineralogist **Olaf P. Jenkins** initiated a program of preparing a new ***Geologic Atlas of California***, aimed at filling in the unmapped regions on the 1938 State Geologic Map project he had previously compiled in the late 1930s (described above). In this effort the base map would be the new USGS 1:250,000 scale 1o latitude by 2o longitude topographic sheets, at double the scale of the 1938 map sheets (1:500,000). This began as something of an adhoc project, compiling information from all available sources, such as the published literature, mapping by students of the major universities, academic theses and dissertations, mapping by state and federal agencies, mapping by mining and petroleum firms, select mapping by the State Division of Mines, and the mapping of **Thomas W. Dibblee, Jr**, which eventually encompassed almost 20% of the state. The project was complicated by the fact that it sought to conjoin geologic mapping of divergent eras, with different scales, and with outdated stratigraphic nomenclature. In many cases, detailed geologic mapping was adjacent to poorly understood, incompletely mapped, or totally unmapped areas. A master legend of the state’s geologic units was included on the margins of each sheet. These include 79 geologic units designated by specific colors and/or patterns, and 39 additional units, distinguished by special symbols.

Eight preliminary black & white sheets were released in 1955. The first color map, the Death Valley Sheet, was released in 1958. When **Ian Campbell** succeeded Jenkins as the State Mineralogist/Geologist in January 1959, he kept the state mapping program alive, under the direction of **Charles W. Jennings**. Campbell added a series of Bouguer Gravity Anomaly overlays on top of the State Geologic Map sheets. All 27 sheets of the State Geologic Atlas were completed in 1966, and in color print by 1969. These were labeled the “Olaf P. Jenkins Sheets,” in honor of Dr. Jenkens’ role in initiating the program (described in Jahns, R.H., 1961, Geologic Map of California, Olaf P. Jenkins edition: *Economic Geology*, 56:6, p. 1154-1156). Revision and periodic updates of these 1o x 2o map sheets continues to be a priority of the state survey.

**Establishment of Geologic Hazards Committee (1967) and Town Geologist (1969) for Portola Valley**

 Shortly after incorporation of the Town of Portola Valley in July 1964, one of the residents, Dr. **Dwight Crowder**, a geologist with the USGS and a member of the Town’s Conservation Committee, recommended geologic mapping and adoption of development regulations to limit exposure to geohazards, which they knew from the surface fault ruptures engendered by the April 1906 San Francisco Earthquake, was a very real hazard. In 1967 the Town Council approved the formation of a **Geologic Hazards Committee**. Its original members included several geologists, including Professor **Ben Page** (Stanford) and Dr. **Robert Wallace** (USGS).

 In 1969 Stanford Geology Professor **Bill Dickenson** began mapping of the surface traces of the San Andreas Fault. Later that same year the town hired its first Town Geologist, Stanford Geology Professor **Arvid Johnson**, CEG. In 1974 the Town Council approved and adopted the “***Geologic Map of Portola Valley***” and “***Movement Potential of Undisturbed Ground***,” and established land use policies for lands shown on those maps. This included recent mapping by the State Division of Mines & Geology for the Alquist-Priolo Special Studies Zone Map (described below) covering Portola Valley, and adoption of Geologic Criteria for all permitted development in the town.

 When Arvid Johnson stepped down in the summer of 1971 he was succeeded by Hayward State Geology Professor **Jon Clark Cummings**, CEG (BS ’52; MS Geol ’56; PhD 1960 Stanford) who prepared a report titled “***Geology*** *a****nd Geologic Hazards, Town of Woodside, California***,” released in 1976. When Cummings stepped down in 1977, he was replaced by **William R. “Bill” Cotton**, CEG, whose firm, Cotton, Shires & Associates, Inc., has served in that capacity ever since.

**Essential Services Building Seismic Safety Act (1968)**

In 1968 the California Legislature enacted the Essential Services Building Seismic Safety Act, which set standards to ensure that essential facilities could withstand seismic loads greater than non-essential services structures. “Essential Services Buildings” are those which are used or designed to be used as a fire station, police station, emergency operations center, California Highway Patrol Office, sheriff’s office, or emergency communications dispatch center.

**State Board of Registration for Geology & Geophysics (1968-2009)**

After seven years of vociferous lobbying by AEG and the political support of State Geologist Dr. Ian Campbell, in 1968 the California Legislature and Governor Reagan approved legislation establishing the California **Board of Registration for Geologists and Geophysicists** (BRGG), which was sponsored by Assemblyman Bill Ketchum of Bakersfield. It was the second geosciences professional registration board in the United States (Arizona had enacted registration for geologists in 1956). The Act became law on November 13, 1968 and made it unlawful to practice geology without a license in California after December 31, 1969. The California State Board of Registration for Geologists was established on June 30, 1969.

Applicants that filed with the board after November 13, 1969 were required to take a written examination, while those who applied before this date and were approved by the board received their licenses through grandfathering. The first certificates were issued in September 1970. By 1972, 848 people re-registered themselves in California as Certified Engineering Geologists (CEGs). Of these, only 518 were California registrants, the remaining being individuals who grandfathered into the title, but maintained residences out-of-state or, out-of-country.

Two years were then expended evaluating the respective roles and responsibilities engineering geologists would have, as opposed to civil engineers. By June 1970 the stated purpose of the BRGG was to protect consumers by ensuring that people practicing geology and geophysics possessed sufficient education, experience, and knowledge to competently perform their duties, such as: geologic mapping of subsurface condition exposed during construction, geologic mapping, assessing presence and risk of landslippage, evaluating groundwater conditions, using remote sensing or aerial photos to investigate the geomorphic character and structure of an area, using geophysical methods to investigate the subsurface, logging boreholes, and assessing mineral deposits.

Geologists and geophysicists were licensed as separate disciplines, with the subspecialty certifications in **engineering geology** (from 1970), and **hydrogeology** (from 1995). This action came largely as a result of landslides, slope failures, and significant property damage, including the infamous Portuguese Bend and Abalone Cove Landslides on the Palos Verdes Peninsula in the 1960s.

With the passage of Senate Bill 1914 in the fall of 2004, the name for licensed geologists in the State of California changed from Registered Geologist (RG) to Professional Geologist (PG), effective January 1, 2005. In 2009 the BRGG was absorbed into the Board of Registration for Engineers and Land Surveyors (BORPELS), to save money. On January 1, 2011 the name was changed to the Board for Professional Engineers, Land Surveyors and Geologists.

**Associated Soil & Foundation Engineers (1969-75); Association of Soil and Foundation Engineers (1975-88); ASFE/The Geoprofessional Business Association (1988-93); ASFE/The Association of Engineering Firms Practicing in the Geosciences (1993-2014); Geoprofessional Business Association [GBA] (2014-present)**

 The insurance situation for geotechnical practitioners worsened markedly in the wake of damaging storms of 1967-68 and 1968-69 in northern and southern California. These storms wrought so much property damage that geotechnical engineering firms suddenly found themselves unable to purchase liability insurance. The principals of ten consulting geotechnical engineering firms met in a Chicago airport hotel in December 1968 to resolve a common problem that threatened their companies: Professional-liability claims were at an all-time high, and professional-liability insurers worldwide refused to cover them. In May 1969 the ten firms formally launched **Associated Soil and Foundation Engineers, Inc**. to identify the causes of professional liability claims and losses, and to develop programs and materials to help geoprofessionals reduce liability exposure in the future. These same firms also agreed to form **Terra Insurance Corporation**, based in Monterey, CA (ASFE headquarters was based in Silver Spring, MD).

 Within a year of its formation, ASFE launched a new contract provision called “*Limitation of Liability*.” After 1970, ASFE member firms re-defined field activities to limit their scope to providing construction observation and testing services, eliminating the terms “*inspection,*” or any inference that they were “*directing,*” “*overseeing*,” or “*approving*” construction activities. The adoption of increasingly tighter Limitation of Liability (LOL) clauses, limiting their exposure to the sum total of the professional fees incurred by the geotechnical engineers, followed shortly thereafter.

In 1975 the organization changed its name to the **Association of Soil and Foundation Engineers**. In 1977, ASFE initiated Organizational [Peer Review](http://www.asfe.org/index.cfm?pid=10283)s of member firms seeking to be insured by Terra Insurance, and helped the American Council of Engineering Companies (ACEC), the American Society of Civil Engineers (ASCE), and the American Institute of Architects (AIA) develop programs based on ASFE’s model. Through Peer Review, firms enhance the quality of their performance by having their methods and materials reviewed and critiqued by experienced peers.

[ASFE-member firms](http://www.asfe.org/index.cfm?pid=10268) underwent a transformation in the mid-1980s, as they expanded their staffs and service mixes to provide expertise to the then-emerging field of hazardous waste remediation and attendant geoenvironmental assessments and remediation [services](http://www.asfe.org/index.cfm?pid=10262). These roles and markets have continued to evolve, and today provide geotechnical, geologic, environmental, construction materials engineering and testing, and related [geoprofessional](http://en.wikipedia.org/wiki/Geoprofessions) services.

In 1985 the organization abandoned “Association of Soil and Foundation Engineers,” changing its name to **ASFE: The Geoprofessional Business Association**. In 1993 the organization’s name was changed again, to **ASFE/The Association of Engineering Firms Practicing in the Geosciences** to better reflect the expansion into geoenvironmental and geohydrology disciplines. In July 2014 the member forms voted to drop the ASFE acronym and replaced it with “**Geoprofessional Business Association (GBA)**, which the membership felt describes the organization and its purpose.

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**National Environmental Policy Act (1969) and regulation of solid waste disposal**

In 1969 Congress passed the **National Environmental Policy Act** (NEPA) in response to increasing societal attention environmental degradation triggered by anthropogenic activities. As a result of NEPA, the US **Environmental Protection Agency** (USEPA) was created and activated on 1 January, 1970, and the related Federal agency programs were considerably re-shuffled. As defined by the Federal government, s*olid waste* encompasses wastes of *municipal* origin (*residential* and commercial, as opposed to *industrial*). Prior to the creation of USEPA in 1970, California acted under the Federal *Solid Waste Management Law,* which required that each County create and submit its own *Solid Waste Management Plan* by January 1, 1974. As a result of the follow-up Congressional legislation (see RCRA in 1976, below) the common forms of wastes and of air pollution were established and then integrated into California’s regulatory agencies. California established a **State Solid Waste Management Board** in 1972, which was renamed the **California Waste Management Board** in 1982. This was incorporated into the **California Integrated Waste Management Board** (CIWMB) established in 1989, one of six agencies subsequently absorbed into the **California Environmental Protection Agency** (Cal/EPA) when it was formed in 1991 (see below).

**USGS/HUD San Francisco Bay Region Environment & Resources Planning Study (1970-83)**

In the early 1970s the Federal Department of Housing and Urban Development (HUD) sponsored joint project with the Western Regional Office of the U.S. Geological Survey termed the***San Francisco Bay Region Environment and Resources Planning Study***. Its purpose was to develop geologic hazard maps for planning purposes in the San Francisco Bay Region. This was an unprecedented undertaking, which involved compiling maps on a wide range of features, including bedrock geology, landslides, groundwater resources, hydrology, water quality, and toxicity. **Earl Brabb**, PG (BA Geol ’51 Dartmouth; MS ’52 Michigan; PhD ’60 Stanford), a geologist with the Regional Geology Group in Menlo Park, supervised this project. His goal was to glean unpublished geodata from the petroleum industry and spearheaded the preparation of large volumes of geologic mapping products as part of the HUD Landslide Mapping Program (described below). These work products were subsequently released by the Association of Bay Area Governments (ABAG). An early example of this program included baseline geologic map sheets of most counties, such as: Brabb, Sonneman and Switzer, 1971, *Preliminary Geologic Map of the Mt. Diablo-Byron Area, Contra Costa, Alameda and San Joaquin Counties, CA*: USGS Open File Map, 1:62,500 [blueline].

 In the aftermath of the HUD program, the Western Regional Office also released several pioneering reports addressing various types of geohazards, and how to assess these for planning purposes. These post-HUD products included the 940 series of Professional Papers: R.D. Borcherdt, ed., 1975, *Studies for Seismic Zonation of the San Francisco Bay Region*: USGS Professional Paper 941-A, 102 p.; A.O. Waananen, et al, 1977, *Flood-Prone Areas and Land Use Planning - Selected Examples from the San Francisco Bay Region, CA*: USGS Professional Paper 942, 75 p.; E.J. Helley, et al, 1979, *Flatland Deposits of the San Francisco Bay Region, California - their geology and engineering properties, and their importance to comprehensive planning*: USGS Professional Paper 943, 88 p.; Tor H. Nilsen, et al, 1979, *Relative Slope Stability And Land-use Planning In The San Francisco Bay Region, CA*: USGS Professional Paper 944, 96 p.; Raymond T. Laird, et al, 1979, *Quantitative Land-Capability Analysis*: USGS Professional Paper 945, 115 p.; and R.D. Brown and W.J. Kockelman, 1983, *Geologic Principles for Prudent Land Use*: USGS Professional Paper 946, 97 p.

**USGS-HUD Landslide Hazard Mapping S.F. Bay Area (1970-77)**

 The USGS-HUD***San Francisco Bay Region Environment and Resources Planning Study*** described above also paid for the preparation of reconnaissance-level bedrock geology and landslide hazard maps, initially at 1:62,500 scale. The first of the true landslide maps was E.E. Brabb, E.H. Pampeyan and M.G. Bonilla, 1972, *Landslide Susceptibility in San Mateo County, CA*: USGS Misc Field Studies Map MF-360.

 These were followed upon by special bulletins dealing with landslide mapping and correlations between rainfall and historic activity , which culminated in the following documents: T.H. Nilsen and B. L. Turner, 1975, *Influence of Rainfall and Ancient Landslides (1950-71) In Urban Areas of Contra Costa County, CA*: USGS Bulletin 1388, 18 p., 1 pl.; T.H. Nilsen, F.A. Taylor and E.E. Brabb, 1976, *Recent Landslides in Alameda County, CA (1940-71): An Estimate of Economic Losses and Correlations with Slope, Rainfall, and Ancient Landslide Deposits*: USGS Bulletin 1398, 21 p, 1 pl.; and T.H. Nilsen, F.A. Taylor and R.M. Dean, 1976, *Natural Conditions That Control Landsliding in the San Francisco Bay Region - and Analysis Based on Data From the 1968-69 and 1972-73 Rainy Seasons*: USGS Bulletin 1424, 35 p., 1 pl. The landslide maps contained in these bulletins were also released at a scale of 1:62,500, or about 1 inch to the mile.

 The key products of the HUD program were 57 7.5-minute USGS landslide quadrangle maps by Tor Nilsen, termed *Preliminary Maps of Landslides and Surficial Soil Deposits*, and released as open file reports, beginning in 1975 (method described in T.H. Nilsen and E.E. Brabb, 1977, *Slope stability studies in the S.F. Bay region, CA*: GSA Reviews in Eng’g Geology, v. III, p. 235-243). In the late 1970s these HUD products were re-released by the **Association of Bay Area Governments** (ABAG), as ***Basic Data Contributions***. Most of these maps are now out-of-print but have been scanned onto CDs and are available from private sources/suppliers, such as Graphic Reproduction in Concord.

**Soil and Foundation Engineers Association (SAFEA) (1971-87); California Geotechnical Engineers Association (1987-2009); CalGeo (2009- present)**

In February 1970, a group of soil and foundation engineers from Southern California met to discuss the status of the profession, and to assess if there was a need to form an organization to represent the unique needs of California’s private-practice geotechnical engineering consultants. In May 1971, the Soil and Foundation Engineers Association (SAFEA) was established with a goal unlike other engineering associations. Rather than focus only on technical research and social events, SAFEA tried to address the key business and legislative issues necessary to advance the profession of private-practice geotechnical engineering. In the mid-1980s SAFEA successfully lobbied for a Geotechnical Engineer title act by the State Board of Registration for Professional Engineers and Land Surveyors. From 1987 onward the professional title “geotechnical engineer” can only be used by those who are duly registered, similar to “structural engineer.” Around 1984 SAFEA released a standard form letter for ***Transfer of Responsibility as Geotechnical Engineer of Record*** when one engineering firm replaces another on the same project. This has gone through a number of minor revisions (most recently updated in Nov 2019). In 1987 the organization changed its name to the **California Geotechnical Engineers Association**, and this was shortened to **CalGeo** in 2009. The organization continues to meet and discuss various issues that impact California’s private-practice geotechnical professionals.

**State Seismic Safety Act of 1971**

 In the wake of the 1971 San Fernando earthquake, the California Legislature enacted a more comprehensive Seismic Safety Act in 1971, which required local municipalities to assemble seismic safety elements by 1975. These municipalities could contract with the California Geological Survey to help prepare geologic databases, and many did.

**Alquist-Priolo Special Studies Zone Act (1972); A-P Earthquake Fault Zoning Act (1994)**

The February 1971 San Fernando earthquake triggered the *Alquist-Priolo Special Studies Zone Act of 1972*, which has been amended on 10 occasions up through 1993. Since 1994 this has been termed the *A-P Earthquake Fault Zoning Act.* An excellent write up on the history of the program with map index is contained in E.W. Hart, 1994, *Fault-Rupture Hazard Zones in California*: CDMG Special Publication 42 (Revised 1994), 34 p. The Fault Evaluation and Zoning Program is currently supervised by the California Geological Survey in Sacramento.

**Establishment of ‘Structural Setbacks’ from active faults (1973)**

 In 1971-72 the Town of Portola Valley’s ***Ad Hoc Geologic Committee*** (described previously) lobbied the Town Council to establish structural setbacks from active fault traces being mapped within the Town Limits. This legislation was enacted by Town Ordinance 1973-119 (in 1973), the first city in California to establish its own fault setback requirements. The state-wide Alquist-Priolo Act became law in March 7, 1973. It required a structural setback of 50 feet from any mapped fault traces that were considered active.

**Statewide adoption of ‘Appendix Chapter 70 - Excavation & Grading’ of the Uniform Building Code (1974)**

 In the second session of the California legislature in 1973, the State of California passed Section 17958, Division 13, part 1.5 of the Health & Safety Code, requiring that all cities and counties in the State of California would enforce ‘Appendix Chapter 70 – Excavation & Grading,’ of the 1973 Uniform Building Code, or its equivalent, no later than March 7, 1974. The California Commission on Housing & Community Development adopted the same mandate in their Section 1090 of Title 25 of the California Administrative Code. These statutes were not always effectively applied or enforced, especially in the State’s more rural counties. By 1977 92% of the state’s building inspection departments enforced the excavation and grading statutes, but only 13% of these agencies had trained grading inspectors (see C.M. Scullin, 1983, *Excavation and Grading Code Administration, Inspection & Enforcement*, Prentice Hall).

**Fault Map of California (1975); Near-Source Fault Zones Maps (1997); and Fault Activity Map of California (2010)**

 In 1975 the California Division of Mines & Geology published the first ***Fault Map of California***, at a scale of 1:750,000, which included all of the then-known faults. This effort was superseded by a second edition, re-named the Fault Activity Map, which was released in 1993-94. The Fault Activity Map includes the assumed state-of-activity of each of the State’s mapped faults, which is useful for assessing risk.

In 1997 the [International Conference of Building Officials](http://www.icbo.org/) (ICBO) published a book of maps to be used in determining engineering factors for new construction in California, titled ***Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada*** (CDMG Product No. MAPS97). This was prepared by the California Division of Mines and Geology (DMG) in cooperation with the Structural Engineers Association of California’s (SEAOC) Seismology Committee. The near-source maps were developed specifically for use with the 1997 UBC and 1998 California Building Code (CBC) to define those areas where an additional factor should be used to reduce risk to life and property during an earthquake.

In 2010 the California geological Survey released a digital ***Fault Activity Map of California***, which assigns state-of-activity of various segments of mapped faults in the Bay Area, including areas where the surface trace is concealed.

**USGS-HUD San Mateo County demonstration projects (1975-92)**

 In the aftermath of the cooperative program with HUD between 1970-75, the USGS continued to explore new methods for preparing planning-related products into the 1980s. They used Sam Mateo County as a “demonstration area,” producing an impressive array of maps utilizing computerized Geographical Information Systems methods before these became commonplace. These products were follow-up to what the Survey had already prepared as part of the HUD study, which had included maps of faults, landslide susceptibility and distribution of late-Quaternary age deposits (Maps MF-355, 360, and 575). The new series of maps were released as Miscellaneous Investigation Series Maps, beginning in 1982. These included the *Geologic Map of San Mateo County* (USGS Map I-1257-A); *Geologic, Scenic and Historic Points of Interest* (Map I-1257-B, 1982); *Dip of Sedimentary Rocks* (Map I-1257-C, 1983); *Engineering Materials & Description of their Engineering Character* (Map I-1257-D, 1985); *Seismic Slope Stability During Earthquakes* (Map I-1257-E, 1985); *Faults and Earthquake Epicenters* (Map I-1257-F, 1986); *Liquefaction Susceptibility* (Map I-1257-G, 1987); *Predicted Shaking Intensities for EQ Comparable to the 1906 SF EQ* (Map I-1257-H, 1986); *Slope Map* (Map I-1257-J, 1988); *Land Use and Land Use Cover* (Map I-1257-L, 1992); and *Debris Flow Probability* (Map I-1257-M, 1992).

 These map products have since been emulated by other jurisdictions in the preparation of county and city seismic safety elements, environmental impact reports, and other planning documents.

**Berkeley Engineering Manuals for Slope Stability (1975) and Settlement (1976) Studies**

 In the early 1970s Berkeley Professor **J. Michael Duncan**, PE began collaborating with **Albert L. Buchignani** (BSCE ’57; MS ’68 Berkeley), who worked for Harding, Miller, Lawson & Associates in San Francisco. The first consultation involved field tests of a debris fill on Bay Mud south of Islais Creek, which came from dredging for a new deep water port facility just to the north of Islais Creek (described in ***Field Test of Debris Fill over Soft Soil***, in ASCE Spec Conf Performance of Earth & Earth Supported Structures, Purdue, 1972). Shortly thereafter new problems arose when a subaqueous slope failure occurred nearby during excavation for a new LASH terminal (***Failure of Underwater Slope in San Francisco Bay***, in Journal of Soil Mech & Fdns Div v.99:SM9, Sept 1973). These assessments brought to light the need for simplified procedures to evaluate slope stability and settlement. Duncan and Buchignani prepared two manuals published by Berkeley’s Institute of Transportation & Traffic Engineering in the Department of Civil Engineering: ***An Engineering Manual for Slope Stability Studies*** (released in March 1975); and ***An Engineering Manual for Settlement Studies*** (released in June 1976). Professor Duncan re-published both manuals in October 1987, after he had moved to Virginia Tech. These manuals had a significant impact on the state-of-the-practice for geotechnical engineering in the SF Bay/Delta region for the next few decades, frequently being referenced in reports and cited as standards in peer reviews by governing agencies and boards.

**Resource Conservation and Reclamation Act** **(RCRA) of 1976**

In 1976 the U.S. Congress enacted the *Resource Conservation and Reclamation Act* (RCRA) of 1976, to be regulated by the U.S. Environmental Protection Agency. This was fully implemented by November 1978, under a regulatory grace program. Each state was given the privilege of administering the entire compliance program under the *Primacy* provision of RCRA, and California was awarded interim primacy in 1991 and continues to respond to additional Federal requirements for its authorization program, consistent with changes promulgated by USEPA. The latest such authorization was granted in 2012 (77 FR 65313, 26Oct).

RCRA defines *Special Waste* as the use and discharge of chemical elements and compounds, in solid or liquid form, as created by such industrial activities as do not produce hazardous wastes, by definition. The Federally mandated program of *special waste management* represents a generally high-volume, low toxicity assemblage of industrial wastes that cannot otherwise be controlled without serious implications to the national economy. As is the case with solid waste, this large waste stream is controlled under the provisions of RCRA of 1976 (as amended) and administered by the California EPA under its primacy agreement with U.S. EPA.

*Hazardous Waste* is defined under RCRA for purposes of the control of toxic industrial waste streams that have been generated since the passage of the act in 1976. In terms of geologic impact, the resulting Federal and State provisions for licensure and compliance of newly-generated toxic elements and compounds in more-or-less limited to the application of standard *permits* written by CalEPA for each site of generation, and by standard site selection conditions and engineered design and construction requirements, and, as such, the regulatory conditions are made similar for all RCRA sites.

**Geologic Hazard Abatement Districts (1979)**

In 1979 State Senator Bob Beverly of Rancho Palos Verdes sponsored legislation allowing the establishment of special “***Geological Hazard Abatement Districts,***” or GHADs (1979 Cal Stat 118, codified as Cal PRC 26500-26601). GHADs are intended to serve as special assessment districts formed to abate actual or threatened geohazards, such as landslides, land subsidence, soil erosion, or other natural or unnatural movements of land (see Robert B. Olshansky’s article “***Geological Hazard Abatement Districts***” in the July 1986 issue of *California Geology*).

The first GHADs formed in California were the Abalone Cove and Klondike Canyon Landslides adjacent to the Portuguese Bend Landslide in Rancho Palos Verdes. Abalone Cove includes 25 homes on a creeping 80-acre landslide and more than 75 residences uphill of the active slide, which could be threatened by it. This district was established on July 19, 1985. Petition for GHADs require signatures from owners of at least 10% of the real property involved, or by resolution of the local legislative body. The application is accompanied by a formal “*Plan of Control*” written by a Certified Engineering Geologist (CEG). If more than 50% of assessed valuation of the proposed district objects to district formation, the process is abandoned.

GHADs have also been employed to provide for preventative maintenance for new or recently-constructed developments, such as those at Canyon Lakes in San Ramon and Blackhawk in Danville, formed in 1985. These GHADs were initially funded by the developers. In other instances, the formation of GHADs can be used as a condition of approval by local governing agencies (an example would be the Castlegate GHAD formed in Orinda in 1996, before any of the homes were occupied). These Bay Area GHADs are principally focused on operations and maintenance of drainage improvements, as well as aging effects, such as slope creep, surficial erosion, and expansive soils.

A California Association of GHADs ([www.ghad.org](http://www.ghad.org)) was formed in 2001, to pool resources and disseminates GHAD-related documents, such as police best practices, white papers, legal opinions, and press releases. There are currently 37 GHADs operating in California. GHADs have also been discussed as a possible mechanism for operation and maintenance of flood protection systems, such as levees.

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980; the Superfund Amendments & Reauthorization Act (SARA) of 1990; and the establishment of SUPERFUND sites**

In 1980 ***hazardous substances*** were recognized and defined under the provisions of the ***Comprehensive Environmental Response, Compensation and Liability* Act** (CERCLA), which was amended in 1990 by the ***Superfund Amendments & Reauthorization Act***(SARA). It is within the realm of CERCLA (aka *Superfund*) that the particular geologic conditions of California become of critical concern to Cal/EPA in its role of conducting the Federal regulatory program for remediation of uncontrolled hazardous substances within California.

Undocumented hazardous waste sites in California, like any USEPA primacy state, comes into line for entry into the CERCLA system, and receives a unique CERCLIS (*CERCLA List)* identification number and site name, and becomes subject to evaluation as to the seriousness and immediacy of its assessed threat to the public. The process calls, in order, for evaluation through a non-invasive *Preliminary Assessment* (PA), from which the HRS (*Hazard Ranking Score*; maximum of 100 points) is prepared and, in due time, a contractor visits the site and undertakes limited subsurface sampling. At this point, the HRS is again revisited and scores greater than 28.5 are subject for elevation to the USEPA SUPERFUND *National Priority List* (NPL) and to receive action funding for continued progress, which may include efforts to identify a financially solvent *Potential Responsible Party* (PRP). Sites for which the SIA yields scores less than 28.5 generally are given NFRAP ("*NiFrap*" = *No Further Remedial Action Planned*), which removes them from eligibility for consideration to be added to the NPL. NPL sites for Missouri require processing by, or through Region VII of the USEPA to become *Proposed* for the NPL and a final *Listing* requires considerable action at HQUSEPA.

Concurrently, Cal/EPA compiles its own *Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in California*, in compliance with State law. Even though USEPA has produced, within this century, an admirable on-line pdf repository of relevant waste management reports, neither it, or Cal/EPA has the on-line capability for citizens to recover, manage and tally such physical sites. Once one is aware of the actual presence of a toxic waste site, remediated or unremediated, recovery of background documents is functional ([www.epa.gov/superfund/sites/cursites/index.htm](http://www.epa.gov/superfund/sites/cursites/index.htm)).

SUPERFUND remediation efforts have far outstripped available funds to undertake costly litigation with PRPs, in order to force them to become named RPs (*Responsible Parties*), so that most States have opted for some form of the *Voluntary Cleanup Program* (VCP). These voluntary programs were initiated by USEPA in 1994, in which the PRP becomes an RP, but is left in charge of the time scheduling under which meaningful remedial action actually take place. VCP nationally shows a very poor record of compliance progress; with start-to-closure of remediation taking as long as twenty years.

**USGS Landslide Hazard Mapping in the S.F. Bay Area (1980-94)**

During the 1980s and into the 90s the USGS Engineering Geology and Regional Geology Branches continued to prepare relevant products addressing landslide hazards in the S.F. Bay Area, some of these being published in the 1982 storms volume, Professional Paper 1434, while other articles have appeared in other Survey publications, such as D.K. Keefer and A.M. Johnson. 1983, *Earth Flows: Morphology, Mobilization, and Movement*: USGS Professional Paper 1264, 56 p. Other articles have appeared in GSA Reviews in Engineering Geology Volumes (discussed later) and occasionally, in Field Guides (W.M. Brown, III, ed., 1989, *Landslides in Central California*: 28th Int’l Geol Congress, Field Trip Guidebook T381, Washington, D.C., 98 p.). Other Survey efforts of these decade were focused on a establishing debris flow thresholds (S.H. Cannon and S. Ellen, 1985, *Abundant Debris Avalanches*: California Geology, v. 38:12 [December], p. 267-272); debris flow hazard warning program in the Santa Cruz Mountains (see D.K. Keefer, et al, 1987, *Real-Time landslide warning During Heavy Rainfall*: Science, v. 238 [Nov 13] p. 921-925); techniques for reducing landslides (W.J. Kockelman, *Some Techniques for Reducing landslide hazards*: AEG Bulletin, v. 23:1, p. 29-52); and long-term monitoring and instrumentation of a landslide test site established by USGS geological engineer Gerry Wieczorek in La Honda in 1975.

These reconnaissance-level map products contain information on a regional scale (usually 1” = 2000 feet) that can be useful in initial attempts to understand basic structure and stratigraphy sufficiently to model things like seismic site response. However, information taken from older publications should be cross-checked with the latest available information from sources such as the USGS, where new interpretations of gross structure have been revealed over the past few years, especially in regards to the cognizance of blind thrusting and construction of balanced structural geologic cross sections. For example, in 1994 Russ Graymer, Davey Jones, Earl Brabb and Ed Helley released a new edition of *Preliminary Geologic Map of the Niles 7.5 minute Quadrangle* as USGS OFR 94-132, on 3 sheets. This map is typical of the new generation of reconnaissance-level geologic maps, which include interpretations of geologic structure, blind thrusting and stratigraphic nomenclature not formerly recognized, that are quite different from the baseline products released in the 1970s.

**Workmanship Guidelines – Contractors State License Board of California (1982)**

In November 1982 the Contractor State License Board (CSLB) prepared a 35-page document titled “***Workmanship Guidelines***” were not officially adopted by the CSLB, but existed nevertheless. The “***guideline provides suggestions for voluntary tolerance levels for construction work for the first year of ownership unless the contractor provides additional warranties***.” The CSLB Workmanship Guidelines included sections pertaining to Excavation and Backfill, Site Drainage, Septic Tank Systems, Waterproofing, Concrete work, Gypsum Wall Board, Framing, Landscaping, Masonry, Stucco, Painting, Plumbing, Roofs, Weather Stripping and Seals, etc. These include acceptable tolerances for minimum slope to drain, out-of-levelness for floors, and plumbness of walls, etc. For each category the guidelines list “***common deficiencies***,” “***acceptable tolerances***,” and “***contractor responsibility***.” These tolerances have been cited in numerous construction claims in California.

**Geotechnical Engineer title act (1986)**

 During the mid-1980s the Soil and Foundation Engineers Association (SAFEA) of California lobbied the State Legislature to enact the Geotechnical Engineer Title Act in 1986, sponsored by State Senator Leroy Green, SE, a licensed structural engineer. SAFEA’s aim was to bring geotechnical engineers up on par with structural engineers, by offering a specialty license. The ‘title act’ does not preclude professional engineers from *practicing* geotechnical engineering, only from calling themselves ‘geotechnical engineers.’ Geotechnical engineers are normally identified by the initials “GE” behind their name. During the first year (1986-87) 930 engineers received the GE title by grandfathering (GE numbers 001 thru 931). These individuals had to demonstrate that they had worked at least four years in geotechnical engineering *after* having received their professional engineering licenses, prior to October 1, 1986. The first 8-hour Geotechnical Engineer examination was administered in April 1987, and these GE registration numbers begin with GE #2000, going forward. The GE title remains the only legal recognition of geotechnical engineers in the United States.

**Unstable Ground: Landslide Policy in the United States (1987)**

 In Feb 1987 Robert B. Olshansky, AICP (BS Geology ’74 Caltech; MA ’75 Brown; MCP ’82 & PhD Env Planning ’87 Berkeley) and J. David Rogers, PE (BS Geology ’76 CSPU Pomona; MSCE ’79 & PhD ’82 Berkeley) co-authored “***Unstable Ground: Landslide Policy in the United States***.” This 67 page article appeared in ***Ecology Law Quarterly***, published by Boalt School of Law at Berkeley. The article was Dr. Olshansky’s dissertation subject while serving as the Principal Planner at Rogers/Pacific. It contains a thorough description of the major earth movement events in southern California and the various theories of liability that had been explored in case law across the USA, with special reference to California because so much of the earth movement losses (FEMA spent over $20 million annually in landslide assistance, and in 1982-83 the property losses in California exceeded $350 million). Over the ensuing decades, this article has become the most cited reference on landslide policy in the USA. From 1990-2018 Dr. Olshansky served on the faculty of the Department of Urban & Regional Planning at the University of Illinois, where he estabsliehd himself as one of the nation’s premier experts on planning aspects of geologic hazards, such as landslides, earthquakes, tsunamis, hurricanes, and sea level rise.

**California Building Code (1988)**

The **California Building Code (CBC)** was approved and incorporated into the UBC in 1988. It was simply the UBC with the addition of California’s more stringent seismic design parameters, as determined by the **California Building Standards Commission** **(CBSC).** The CBSC reviews and approves building standards proposed and adopted by state agencies, Administers California's building code adoption processes, resolves conflict, duplication, and overlap in building standards. Almost every municipality in California uses the CBC, while a few entities use a more conservative version (e.g. San Francisco uses their own **San Francisco Building Code**).

**California Environmental Protection Agency (Cal/EPA) in 1991**

The **California Environmental Protection Agency (**Cal/EPA) was created executive order in 1991, following a "Big Green" initiative by Governor Pete Wilson, establishing a cabinet-level agency to oversee state environmental regulations and research. Following inter-agency reorganizations, it became a cabinet department in July 1991. Cal/EPA is composed of six departments, boards and offices responsible for [environmental](http://en.wikipedia.org/wiki/Natural_environment) research, regulating and administering the state's environmental protection programs, and fulfilling [hazardous waste](http://en.wikipedia.org/wiki/Hazardous_waste) cleanup. These departments include: [**California Air Resources Board**](http://en.wikipedia.org/wiki/California_Air_Resources_Board); [**Department of Pesticide Regulation** (DPR](http://en.wikipedia.org/wiki/California_Department_of_Pesticide_Regulation)); [**Department of Toxic Substances Control** (DTSC](http://en.wikipedia.org/wiki/California_Department_of_Toxic_Substances_Control)); [**Office of Environmental Health Hazard Assessment**](http://en.wikipedia.org/wiki/California_Office_of_Environmental_Health_Hazard_Assessment); and the [**State Water Resources Control Board**](http://en.wikipedia.org/wiki/California_State_Water_Resources_Control_Board) (WRCB); and **California Department of Resources Recycling and Recovery** (CalRecycle), which replaced the [California Integrated Waste Management Board](http://en.wikipedia.org/wiki/California_Integrated_Waste_Management_Board) in 2010.

**Stormwater Best Management Practice Handbook (1993)**

 The ***Stormwater Best Management Practice Handbooks*** are products of the California Stormwater Quality Association (CASQA). The handbooks were originally published in 1993 by the California Stormwater Quality Task Force (SWQTF), the predecessor of CASQA. As part of this project, the original handbooks were updated in 2003 and 2011 to reflect the current state of stormwater quality management practices and to make the handbook accessible via the Internet at ***www.cabmphandbooks.com***.

 CASQA is a nonprofit public benefit corporation and is not organized for private gain of any person. It is organized under the Nonprofit Public Benefit Corporation Law of California for charitable and educational purposes. The specific purpose of CASQA is to assist those entities charged with stormwater quality management responsibilities with the development and implementation of stormwater quality goals and programs. CASQA serves its members through various educational, technical, and scientific initiatives. The publication of the Stormwater Best Management Practice Handbooks is one of CASQA’s educational and technical initiatives. This project was funded through contributions from public agencies throughout California, whose support made the handbooks possible.

**Natural Resources & Conservation Service (1995)**

In 1995 Congress reorganized the Department of Agriculture. The Soil Conservation Service was re-designated as the Natural Resources Conservation Service (NRCS), and within each County the NRCS office was co-located with a Consolidated Farm Service Agency (formerly the Agricultural Stabilization and Conservation Service) office. County soil survey reports are usually available at no charge from these offices, though many counties only offer poor quality machine copies. A comprehensive listing of soils reports was compiled by the California Geological Survey: ***An Index to Soil Surveys in California***. This is available from the Department of Conservation and it lists every report of any length, by county, dating back to 1900.

**Increased funding for A-P Earthquake Fault Zone mapping (2014)**

 On June 30, 2014 Governor Jerry Brown approved $1.49 million for fault hazard zone mapping, with $1.3 million in annual dedicated funding for this same activity by the California Geological Survey (CGS). This increase came after the CGS witnessed its annual funding dropping from $9.1 million in 2001 to just $2.9 million in 2013. The legislation was sponsored by State Senator Ted Lieu of Torrance, concerned that the CGS was unable to complete ongoing studies of the Santa Monica and Hollywood faults, as well as portions of the Whittier and San Andreas faults. CGS’s inability to prepare such maps were impacting projects in those areas of west Los Angeles County. These funds represent a 30% increase in CGS’s annual budget and allowed them to hire three new engineering geologists to help prepare the A-P Zone hazard maps.

**Notable boards and expert panels conveened in Northern California**

**Board of Engineers upon the City Grades for the City of San Francisco (1853-54)**

 Brevet Major **J.C. Barnard** (U.S. Army Engineers), **A.T. Arrowsmith (**U.S. Coast Survey) and **J.A. Hardie** (U.S. Third Artillery) established the City Base level at five feet above the extreme high tide, to accommodate the *differential settlement* being observed along wharves and waterfront streets (the highest tide recorded over the next 75 years above standard sea level was 5.18 feet on Nov 18, 1918). The first U.S. Coast Survey map of San Francisco was completed in 1852-53 (the first Coast Survey Map of Oakland Harbor and vicinity was completed in 1859-60). The office of City Surveyor was established soon thereafter in San Francisco (1855).

**Consultants on foundations of the San Francisco Ferry Building (1893)**

 Professors **Charles D. Marx** and **Charles B. Wing** of the newly formed civil engineering department at Stanford University were appointed consultants to review the plans for timber pile supported foundations of the San Francisco Ferry Terminal, at the foot of Market Street in 1893. This work included the first pile load tests in the Bay Area, building on the techniques pioneered by Army Corps of Engineers Captain P.G.T. Beauregard for the U.S. Customs House in New Orleans 40 years previous, in 1853.

**Special Report of Maj. Gen. A.W. Greeley - Earthquake in California - April 18, 1906**

 Following the Great San Francisco Earthquake of April 18, 1906, the U.S. Army’s Pacific Division, headquarted at the Presidio of San Francisco, was dispatched to provide relief operations to the region’s most damaged neighborhoods. A comprehensive report of these relief and security operations was prepared under the supervision of Major General **Adolphus W. Greely**, U.S.A., Commanding the Pacific Division of the U.S. Army. The comprehensive report the story of how permanent relief camps and hot food kitchens were established across San Francisco, with detailed tabulations listing how many refugees lived at each releief camp, who managed the emergency shelter and sdsitruibution facilities, and how many citizens were served by each faciltty, etc. The 210-page document also includes 40 photographic plates illustrating the relief operations. An oversize color map denotes the burned-out areas of San Francisco, the locations of military districts, relief camps, and hot food kitchens established by the Army, as well as the individual names of all the wharves serving San Francisco, and many of the industrial sistes, such as the Union Iron Works, etc.

**State of California Earthquake Investigation Commission (1906-08)**

 Three days after the April 18, 1906 San Francisco Earthquake California Governor George C. Pardee appointed a ‘State Earthquake Investigation Commission’ to make a scientific investigation of the earthquake and report their results to the legislature, the public, and the scientific community. The Commission members were: **Andrew C. Lawson**, Chair (Prof of Geology and Mining at Berkeley), **John C. Branner** (Prof of Geology and Mining at Stanford), **Charles Burkhalter** (Chabot Observatory in Oakland), **G. K. Gilbert** (USGS geologist at Berkeley), **Harry F. Reid** (Prof of Geology at Johns Hopkins), **A. O. Leuschner** (Prof of Astronomy at Berkeley), and **W.W. Campbell**. Of these, Gilbert and Reid were the only two having any prior experience studying earthquakes.

 The committee initially convened on April 21st. Their preliminary report was delivered to Governor Pardee on May 31, 1906. After this date, the commission’s work, and that of several dozen supporting scientists and engineers, was supported by the Carnegie Institution of Washington, DC. Their report was published two years later (late summer of 1908) and was titled: “***The California Earthquake of April 18, 1906. Report of the State Earthquake Investigation Commission***,” commonly referred to as the “Lawson Report” for years thereafter. Contributors cited on the title page included **A.C. Lawson, G.K. Gilbert, H.F. Reid, J.C. Branner, H.W. Fairbanks, H.O. Wood, J.F. Hayford** and **A.L. Baldwin, F. Omori, A.O. Leuschner, George Davidson, F.E. Matthes, R. Anderson, G.D. Louderback, R.S. Holway, A.S. Eakle, R. Crandall, G.F. Hoffman, G.A. Warring, E. Hughes, F.J. Rogers, A. Baird**, and many others, unnamed. A second volume titled “***The Mechanisms of the Earthquake***” was written by **Harry F. Reid** and appeared two years later, in 1910.

**Board to Investigate the Impact of the Great 1906 Earthquake (1906-07)**

 Panel comprised of **Grove Karl Gilbert** (USGS geologist at U.C. Berkeley), **Richard Lewis Humphrey (**USGS structural materials specialist**), John Stephen Sewell** (Captain, US Corps of Engineers, West Point Class of 1891), and **Frank Soule** (former Dean of Engineering at U.C. Berkeley, and West Point Class of 1866). They co-authored the report titled: ***The San Francisco Earthquake and Fire of April 18, 1906, and Their Effects on Structures and Structural Materials***, published in 1907. This was the first report to note the impact of surficial geology on intensity of seismic site response.

 Berkeley civil engineering Professor Frank Soule followed up with the notable article titled “***Effect of Earthquake on the Structures of San Francisco***,” while his mining engineering colleague Professor **Samuel Benedict Christy** penned a book titled “***Some Lessons from the earthquake and Fire, 1906***.”

**Engineering Commission on the Rebuilding of Stanford University (1906-07)**

Following the disastrous damage to the Stanford University campus during the April 1906 San Francisco earthquake, the university appointed an engineering commission to provide professional advice in connection with the rebuilding of the campus. This commission was comprised of Professors **Charles D. Marx** and **Charles B. Wing** of civil engineering, and **William F. Durand** of mechanical engineering.

**Board of Advisory Engineers - Stanislaus Hydroelectric Power Plant (1908)**

In 1911 a Board of Advisory Engineers was appointed to advise the California Electric Power Co. on the design and construction of their Stanislaus Hydroelectric Power Plant. This panel included: San Francisco consulting engineer **John D. Galloway** (BSCE 1889, Rose Polytech Inst), Stanford civil engineering Professor **Charles D. Marx**, (BSCE 1878 Cornell; Dipl Eng 1881 Karlsruhe Polytech) and **Wynn Meredith**, a mechanical engineer familiar with the operation of power plants.

**California State Water Commission (1912-unkn)**

 A State Water Commission was established on March 23, 1912, to administer the waters of California and assist in framing the water laws of the state. The first chairman of this commission was Professor **Charles D. Marx** of Stanford University. Within a few years, this activity was assumed by the Division of Water Rights within the State Department of Public Works. The first Chief Engineer of the Division of Water Rights was **Edward L. Hyatt** (1888-1954), a native of Riverside, who received his BSCE from Stanford in 1910. He was elevated to the position of State Engineer of California in 1927 and enjoyed a 38-year career in state service.

**Engineering Board for the Moccasin Creek hydroelectric plant (1914)**

In May 1914 the City of San Francisco appointed a board of experts to advise them on the hydroelectric power plant at Moccasin Creek, which had been proposed by John R. Freeman in his momentous report on the Hetch Hetchy Aqueduct system in 1912. Moccasin Creek had a fall of 1300 feet with an inverted siphon about 3000 ft long, giving it the highest pressure head of any significant hydroelectric plant in the United States, up to that time.

They chose Stanford University Professor **W. F. Durand** (BME 1880 USNA; PhD 1888 Lafayette College), a mechanical engineer and eminent in the field of surge pipe design, San Francisco consulting engineer **John D. Galloway**, because of his experience with the design and operation of high head power plants, and **Frank G. Baum**, a leading electrical engineer, whose work on power plant design, operation, and transmission problems was much respected. Their work was carried out between May 4th and early August 1914.

**Subsoil Committee of the San Francisco Section, American Society of Civil Engineers (1922)**

 **A.A. Brown**, Chairman (Construction Engineer for C&H Sugar Refining Co., Crockett), Berkeley civil engineering Professor **Charles Derleth, Jr.** (BS 1894 CCNY; CE 1896 Columbia), **James M. Owens** (Engineer of Street Improvement Plans, SF City Engineer’s Office), and **Frank G. White** (State Harbor Commission). They were charged by the San Francisco Section ASCE to investigate and report on “***Foundation problems in the Filled-in Area of San Francisco***.” The committee made regular reports at the b-monthly meetings of the San Francisco Section, and issued a type-written report on February 20, 1923, which was archived in the files of the section in San Francisco.

**Consulting Engineers to the East Bay Municipal Utility District (1923-24)**

 The East Bay Municipal Utility District (EBMUD) was formed on May 8, 1923, the product of a bond issue passed by the voters of Oakland, Berkeley, Alameda, Emeryville, Albany, San Leandro, and El Cerrito. Richmond and Piedmont would later become part of the system. The new district hired **Arthur Powell Davis** as their new General Manager & Chief Engineer. Davis had served as Director of the U.S. Reclamation Service from 1906-23. He soon drew upon two noted engineers as consultants to the new district: retired Corps of Engineers Major General **George W. Goethals**, who had overseen construction of the Panama Canal between 1907-14; and, **William Mulholland**, General Manager & Chief Engineer of the Los Angeles Bureau of Waterworks & Supply, who had conceived and supervised the design and construction of the 233-mile long Los Angeles Aqueduct, between 1906-13.

Powell’s first order of business was to select a suitable dam site in the Sierra foothills as a long-term supply for EBMUD. Powell, Goethals and Mulholland all agreed upon the Mokelumne River watershed and the dam site at Lancha Plana as the most desirable site for a reservoir. This site was subsequently developed in 1927-29 and renamed the **Pardee Dam**, upon its completion in June 1929. At 345 ft, it was one of the highest concrete dams in the world, with a maximum storage of 215,000 acre-feet.

**Committee on Building Safety against Earthquakes (1924)**

In 1924 the **Seismological Society of America** formed a standing Committee on Building Safety Against Earthquakes composed of representatives from the American Society of Civil Engineers, American Institute of Architects, National Board of Fire Underwriters, and the Cities of San Francisco and Los Angeles. The members included San Francisco-based consulting engineers **Henry D. Dewell**, PE and **Walter L. Huber**, PE and Stanford geology Professor **Bailey Willis**.

The committee took Willis’ *Fault Map of California* published by the Seismological Society of America and formulated tables listing the probable horizontal acceleration of expected earthquakes, based on observations made after the 1906 San Francisco earthquake, using the old Rossi-Forel scale, the distance from known fault lines, and the character of the underlying soil. **Dewell** was the first engineer to apply these parameters in assessing the damage patterns emanating from the June 1925 Santa Barbra earthquake, and reported the results in *Engineering News Record*.

**Board of Consulting Engineers (1924-25) and establishment of the Port of Oakland (1926)**

 In November 1924 a board of three consulting engineers was appointed by the City of Oakland to formulate a long-range plan for municipal port development. This board was comprised of **Gustave B. Hegart**, chief engineer and manager of the Port of Portland, Lt Colonel **Charles T. Leeds**, consulting engineer to the Port of Los Angeles, and Professor **Charles D. Marx**, PE of Stanford University. Their *Report on the Port of Oakland* was completed in September 1925. It recommended $9.6 million worth of improvements to be able to handle 100,000 tons of cargo annually. In March 1926 Hegardt was hired as manager and chief engineer of the newly formed Port of Oakland. He brought in **Arthur H. Abel** from Portland as his assistant port manager, and construction of the recommended facilities commenced in July 1926. Hegardt remained the new port’s manager until 1932, when Abel succeeded him, serving in that capacity until 1952. It was Abel who is largely responsible for the development of the modern Port of Oakland, including the expansive Navy Supply Center and Army Port of Embarkation Center during the Second World War (1941-45).

**Board of Consulting Engineers for the Alameda Estuary (Posey) Tube (1924-28)**

 In 1924 Alameda County appointed a Board of Consulting Engineers to review their plans for a vehicular tube to be constructed beneath the San Antonio Estuary between Oakland and Alameda near Webster Street, to replace the old swing draw-span Webster Street Bridge (which was wrecked by the collision of the steamer Lancaster on January 7, 1926, while the Posey Tube was under construction).

This board was comprised of: **Clifford M. Holland**, Professor **William H. Burr**, and Professor **Charles Derleth, Jr.** of U.C. Berkeley. C. M. Holland (BA 1905, BSCE 1906 Harvard) had supervised the construction of four major tunnels in New York City, and was directing construction of the largest vehicular tunnel ever attempted up to that time (beneath the Hudson River), when he died of an apparent heart attack at age 41, on October 7, 1924. That project was then named the Holland Tunnel when it opened in November 1927. William H. Burr was a Professor of Civil Engineering at the Columbia University in New York who had served on the various Isthmian Canal Commissions (between in 1899-1906) and most of the consulting boards for major tunneling projects around New York City and Boston. Berkeley civil engineering Professor Charles Derleth was a Consulting Engineer for Alameda County on numerous municipal structures, including the Posey Tube.

The work on the Alameda Estuary Tube was supervised by Alameda County Surveyor **George A. Posey**, PE who served as the project’s chief engineer, after voters approved a $5 million bond issue in early 1925. **Ned D. Baker** was design engineer, supervising all office design work, **Merton C. Collins** (BSCE 1912 Berkeley) was the project’s structural and ventilation engineer, and **Lochiel M. King** was construction engineer in charge of field work. Professor **Bruce Jameyson** (BSCE 1917 Berkeley) of Cal Berkeley’s civil engineering department served as Alameda County’s consulting structural engineer, an association which continued on more than 100 other County projects over the succeeding 30 years, mostly with respect to bridges.

The contract for construction was awarded to the California Bridge & Tunnel Co. on April 28, 1925, calling for completion in 900 days. The subway was 4,437 ft long. One of the project’s most novel aspects was its use of precast concrete tubes, which were sunk in place to form the middle 2,437 ft of the subway, beneath the estuary. These segments were 37 ft in diameter (32 ft inside) and 203 ft long, placed on crushed rock and tremied concrete pads and backfilled with a sand cushion. The project was completed on October 27, 1928 and christened the “**George A. Posey Tube**.” A second parallel tube was constructed by the State of California in 1960-62, using 12 precast concrete tube segments. These served as the models for the steel BART Transbay Tube constructed in 1966-69.

**Ridgway Report on the feasibility of a San Francisco-Oakland Bay Bridge (1927)**

Overwhelmed by the conflicting forces promoting various schemes and proposed routes for a trans-East Bay bridge and by the obdurate position of the War Department, the San Francisco Chamber of Commerce decided to fund an independent study of sufficient credibility to convince the War Department that a bridge could be built without impeding navigation in the San Francisco Bay. In early 1927 the chamber provided $40,000 for the study and selected a three-man panel of engineers, comprised of: **Robert Ridgway**, Chief Engineer of the New York Transit Commission, Professor **Arthur N. Talbot** (BSCE 1881 Illinois) of the University of Illinois, and **John D. Galloway** (BSCE 1889 Rose Polytechnic Inst.), of San Francisco. Ridgway had recently served as President of the American Society of Civil Engineers in 1925. Talbot hadserved as ASCE President in 1918 and had just retired from the University of Illinois, where he had championed the practical uses of reinforced concrete. Galloway was born in San Jose and had operated several engineering firms in San Francisco since 1900. None of the men had been involved in any of the private franchise applications up to that time. San Francisco City Engineer **M. M. O’Shaughnessy** (BSE 1884, Royal Univ Ireland) served as an adjunct member of the panel.

Ridgway, Talbot, and Galloway released their findings in a detailed report dated May 5, 1927. Referred to as the “**Ridgway Report**” in the media, it included detailed traffic studies as well as structural mechanics and engineering aspects of such a long bridge, slated to be the world’s longest, by a significant margin. The team addressed the bridge types, suitable alignments, and likely mix of traffic (cars, trucks, trains). It’s only weaknesses were in evaluating the geologic conditions beneath the Bay and suggesting a means to fund construction. The Ridgway board selected an alignment that differed from those previously proposed, although the eastern half of their Alignment 3 was the route ultimately selected.

 In June 1927 San Francisco made another application to the War Department for a permit to construct a Bay Bridge, based upon the recommendations of the Ridgway Report. In October 1927 the War Department once again rejected San Francisco’s application.

**Board of Experts - Lafayette Dam failure (1928-29)**

The160 ft high Lafayette Dam was an earthfill structure placed at a record rate of 9000 yds3 per day in 1928 by George Pollack Construction Co. of Sacramento for the East Bay Municipal Utility District (EBMUD). This rapid loading led to high pore pressures developing in the clayey foundation, comprised of up to 30 ft of overconsolidated colluvium. Between Sept. 17-21, 1928 the embankment suffered “excessive settlement” of 22 to 26 feet, basically a massive landslide involving about half of the dam’s downstream shell, which extended well into the dam’s upstream face.

EBMUD appointed a board of four nationally-known experts to investigate the causes of the slope failure. This board included: consulting engineer **A.J. Wiley** of Boise, Idaho, retired Stanford Professor **Charles D. Marx**, **Charles H. Paul**, former Chief Engineer of the Miami Conservancy District in Dayton, Ohio, and Caltech Geology Professor **F. Leslie Ransome**, NAS. Wiley had recently chaired Governor C.C. Young’s Blue Ribbon Panel to Investigate the Failure of the St. Francis Dam near Los Angeles the previous March, assisted by Professor Ransome. The board made their first visit to the site on October 28th, accompanied by **Arthur Powell Davis**, EBMUD’s Chief Engineer & General Manager. The board was authorized to take all the time they deemed necessary to ascertain what had occurred and what might be done to mitigate the damage. The dam was eventually completed in 1932, but with only 37% of the original storage capacity. It has the widest cross section of any earth dam in California.

**Board of Geologists for the Martinez-Benicia Bridge (1928)**

 During the design of the ‘Suisun Bay Bridge’ across the Carquinez Straits between Benicia and Martinez in 1928, the Southern Pacific Railroad retained a board of consulting geologists the advise them on the locating the bridge’s alignment across the head of the Carquinez Straits. The railroad hired geology Professor **Andrew C. Lawson** and his assistant **Louis N. Waterfall** of U.C. Berkeley, Stanford geology Professor **Bailey Willis**, **Joseph A. Taff** (BS Geol 1894 Texas), who had previously worked for the USGS (1889-1909) and was a consultant based in Palo Alto, and, Dr. **G. D. Hanna**, paleontologist with the Associated Oil Co.

 Lawson appraised the railroad of the Southampton and Martinez faults, which crossed both of the railroad’s proposed bridge alignments. Prior to construction of the Suisun Bay Bridge, the SP ran trains across a ferry that ran due west-east, between Carquinez Point (a pier in Benicia) and Port Costa, a distance of just under a mile, but which crossed the Southampton fault (this line had been established in 1879). The railroad decided to move their bridge two miles upstream, between Army Point, east of Benicia, and Suisun Point, east of Martinez. The Martinez fault projected beneath the north end of this new alignment, but was perceived to pose much less risk (only 200 to 300 ft of offset) than the larger Southampton fault. In addition, the geologists could find no evidence that the Martinez fault extended north of Army Point. The decision process is described in: C.R. Harding’s article, “***Location and Design of Southern Pacific Company’s Suisun Bay Bridge as affected by Consideration of Earthquakes***,” Bulletin Seismological Society of America v. 19:3, September 1929. Originally named the Suisun Bay Bridge, its name was later changed to the Martinez-Benicia Bridge, shortly after its completion in 1930.

**First pseudostatic seismic loads applied to a bridge design (1928)**

When the **Benicia-Martinez Bridge** was designed, the Southern PacificRailroad’s principal engineers associated with the project were **Carroll R. Harding**, Assistant to the President, and **Walter H. Kirkbride**, Engineer of Maintenance & Way (who became SP’s Chief Engineer in 1932, and served as President of the Seismological Society of America in 1944). Southern Pacific hired renowned bridge engineer **Ralph Modjeski** of Chicago to oversee the design of the bridge. Modjeski decided to employ simple trusses, using seven Warren through truss spans of 531 ft length over the main channel, one vertical lift span 328 ft wide over the navigation channel (to provide 135 ft of clearance), and multiple Pratt deck truss spans for the approach sections (tail spans). The overall length of the bridge was 5,603 ft, accommodating two parallel tracks on 13 ft centers, with a deck width of 30 ft. The rails were situated 70 ft above the water for 4,050 ft of the span. All of the bridge’s supports extended to the underlying bedrock, up to 80 ft deep. These caissons were designed and built by **Daniel Moran** of Moran & Proctor of New York, who also built the foundation for the San Francisco-Oakland Bay Bridge, a few years later.

Based on their discussions with the geologists described above, the bridge was designed to resist earthquake vibrations, by employing a “lateral acceleration of 5 ft per second,” or **0.16g**. This lateral load was believed to be twice the intensity of the 1906 San Francisco earthquake, and 1.5 times that recorded in the 1923 Tokyo earthquake (described in W.H. Kirkbride, “***The Martinez-Benicia Bridge,***” in the 1934 ASCE Transactions (v.99:154-181). The bridge was constructed between April 1929 and October 1930. It was the last simple truss railroad bridge built in the United States at a new location.

**ASCE Committee on Earths and Foundations (1929)**

 This committee of ASCE was formed in 1929 to foster research work in the emerging field of foundation engineering and soil mechanics. Its goal was to establish centers of research in the United States, in cooperation with the hydraulics laboratories at the University of Minnesota and Iowa State then engaged in the extensive flood and navigation improvements being promulgated along the Mississippi River. The principal members were: **Lazarus White**, chairman; **George E. Beggs**, **M.L. Enger**, **R.J. Fog**, **Glennon Gilboy** of MIT; **Harry T. Immerman**, **Dimetri Krynine** of Yale, sanitary engineer **Frank A. Marston**, **George Paswell**, and **Karl Terzaghi**. The committee cooperated with **Ralph Proctor** of LADWP in approving the methodologies employed in developing his compaction tests for the Bouquet Canyon Dams in 1931-33, and with Prof. Gilboy on the hydraulic fill embankments designed by the Corps of Engineers for the Muskingum Project in eastern Ohio in 1934-39, which included construction of the Corps’ first soil mechanics laboratory.

**Subsoil Committee of the San Francisco Section of ASCE (1929-32)**

 **A. A. Brown** (Chairman), **Hyde Forbes** (Consulting Geologist and Engineer), **Leon H. Nishkian** (consulting structural engineer, BSCE 1906 Berkeley), **James M. Owens** (Engineer of Street Improvement Plans, SF City Engineer’s Office), and **Frank G. White** (Chief Engineer, State Harbor Commission). This panel was appointed by ASCE SF Section President **I.C. Steele** in April 1929 and continued by his successors, consulting engineers **Henry D. Dewell** (BSCE 1906 Berkeley) and **Leon B. Reynolds**. Their preliminary report was presented to the Section on April 2, 1931 and summarized at the regular section meeting on April 21st. In August 1931 the Board of Directors of the San Francisco Section authorized the publication of a 107 page report titled: “***Subsidence and the foundation problem in San Francisco.***”

 The published report was released in September 1932. The book was edited by **George F. Whitworth,** whose May 1924 senior thesis at Berkeley was titled “*The Subsoil Conditions in the Filled-In Districts of San Francisco.*” The 1932 ASCE volume was a remarkable compilation, which included 25 plates (several in color), which included every historic map of San Francisco (back to 1775), extensive records of the City’s seawalls, ground subsidence isopleth maps, and the logs of every soil boring drilled in the city up thru 1931. It included quotes from Karl Terzaghi’s article “*The Science of Foundations, Its Present and Future,*” which appeared in the ASCE Proceedings in 1927. The 1932 compilation figured prominently in geotechnical practice for the next 40 years, and was referenced repeatedly during the explorations for BART in the mid-1960s.

**Hoover-Young San Francisco Bay Bridge Commission (1929-30)**

 Driven by the development of automobiles, the dream of building a bridge to connect Oakland and San Francisco become a financial and technical possibility in the early 1920s. The problem was where to put the bridge and how to pay for it. Proposals for privately-funded toll bridges were solicited in 1921 and 1926, but these were unable to raise the necessary capital. From 1926 onward, the emphasis shifted to public construction of a San Francisco-Oakland Bay Bridge.

A joint state-federal commission was appointed by California Governor C.C. Young and President Herbert Hoover in August 1929, known as the Hoover-Young Commission. The members included: retired RADM **Luther E. Gregory**, USN, BGEN **George B. Pillsbury**, USA, LTC **Edmund L. Daley**, USA, representing the Army and Navy. **George T. Cameron**, editor of the San Francisco Chronicle, and State Senator **Arthur H. Breed** representing San Francisco and the East Bay, respectively. Civil engineering Professor **Charles D. Marx**, PE of Stanford University and railroad and mining engineer **Mark L. Requa** were both appointed by Hoover as at-large delegates. Both were close associates of Hoover, dating back to his days as an undergraduate at Stanford. The most important member was probably the commission’s secretary, **Charles H. Purcell**, PE (BSCE 1908 Nebraska), the recently appointed State Highway Engineer for California.

The commission met in early October 1929 and tasked the State Department of Public Works/Division of Highways to make detailed engineering, economic, and traffic studies of a trans-bay bridge between Oakland and San Francisco. These studies were managed by **Purcell** and **Charles E. Andrew**, Bridge Engineer for the Division of Highways. The first order of business was the sinking of exploratory borings along the five proposed routes by **Duncanson-Harrelson**, a respected construction firm based in South San Francisco. The alignments probed were basically those suggested in the 1927 Ridgway Report, described above) to ascertain the depth to bedrock or suitable foundation materials. The borings revealed a relatively shallow “ridge” of bedrock between Yerba Buena (Goat) Island and Rincon Hill of just 164 ft, far shallower than any of the pother proposed alignments. East of Yerba Buena the bedrock surface fell off dramatically, only one boring penetrating that interface, at a depth of -323 ft just 1,400 ft east of Yerba Buena. The path due east to the existing Key Mole could support heavy bridge elements founded on deep pile groups, extending into the sandy clays of the San Antonio Formation.

After all of the requested reports were completed, the commission re-convened in late July and early August of 1930, issuing their findings in a report dated August 12, 1930. The commission played a pivotal role in deciding where the Bay Bridge would be located, its basic geometry with regards to acceptable vertical and horizontal clearances, and how it could be funded. They were aided in this final regard by the establishment of the California Toll Bridge Authority, or CTBA, in 1929. The commission’s conclusions were accepted and, in 1931, the State retained a board of engineering consultants (described below) to review the foundation design and structural engineering details. Under the guidance and leadership of Purcell, Andrew, and Engineer of Design **Glenn B. Woodruff** (hired in 1931), bridge construction commenced on July 9, 1933 and the project was completed in less than 3-1/2 years, on November 12, 1936.

**Advisory Board of Consulting Engineers for the Golden Gate Bridge (1929-37)**

 On May 23, 1923 the state legislature passed an act creating the Golden Gate Bridge and Highway District (GGBHD). **Joseph B. Strauss** of Strauss Engineering Co. was appointed Chief Engineer of the GGBHD on August 15, 1929. On October 7, 1929 the GGBHD established an Advisory Board of Consultants, composed of suspension bridge engineers **Leon Moisseiff** and **O.H. Ammann** of New York, and U.C. Berkeley Dean of Engineering **Charles Derleth, Jr.** Strauss appointed U.C. Berkeley Professor **Andrew C. Lawson** as Consulting Geologist.USC Professor **Allan E. Sedgwick** was subsequently appointed in 1931 as anAssociate Consulting Geologist. The Traffic Engineer was **Sydney W. Taylor, Jr.** of Berkeley, and the Consulting Architect was **Irving F. Morrow.** Former University of Illinois Professor (1914-21) **Charles A. Ellis**, Vice President of the Strauss Engineering Co. and the principal designing engineer, was an original member of the advisory board, until he was fired by Strauss in late 1931.

The original set of plans and specs for the bridge were approved by the Golden Gate Bridge & Highway District on Aug 28, 1930 and a $35 million bond issue was approved by voters on Nov 4, 1930. Construction of the bridge was delayed until January 5, 1933 because of financing problems associated with the Great Depression. The bridge took five years to construct. Its completion was celebrated during the week of May 27, 1937, about six months after the San Francisco-Oakland Bay Bridge. The Golden Gate Bridge’s main span of 4,200 ft and tower height of 746 ft were both world records that stood until completion of the Verrazano Narrows Bridge in Nov 1964. The Golden Gate Bridge has a total length of 8,981 ft. The bridge’s main span now ranks 9th longest in the world.

**Consulting Board of Engineers for the San Francisco-Oakland Bay Bridge (1931-36)**

 In December 1930 State Public Works Director Earl Lee Kelly announced that the California Toll Bridge Commission to appoint a consulting Board of Engineers for the proposed San Francisco-Oakland Bay Bridge project and indicating that **Ralph Modjeski** would be the chairman and that Dan Moran would be the principal consultant on foundations. Funding problems precluded the consulting engineers from coming under contact until August 1931. This board was chaired by **Ralph Modjeski** of Modjeski & Masters in Chicago and New York (who actually grew up in southern California), would supervise the bridge’s design; foundation engineers **Daniel Moran** and **Carlton Proctor** of Moran & Proctor in New York, would be responsible for the design and construction of the bridge’s foundations; suspension bridge engineer **Leon Moisseiff** of New York; U.C. Berkeley Dean of Engineering **Charles Derleth**, Jr.; and San Francisco structural engineer **H. J. Brunnier**. Berkeley geology Professor **Andrew C. Lawson** served as the project’s consulting geologist. There was also a board of consulting architects, comprised of Arthur Brown, Jr., John J. Donovan, and Timothy L. Pflueger.

Throughout 1932 Modjeski, Moran, Proctor, and Moisseiff and members of their staffs convened informal meetings in New York, calling themselves the “***New York Members of the Consulting Board***.” This was helpful as the most vexing problems of that first year revolved around the design of the bridges foundations, and whether these could all be taken down to bedrock.

Civil Engineering Professor **Raymond E. Davis** at U.C. Berkeley tested samples of the foundation materials for the board, when they were debating the possibility of using floating caissons on the East Span, which they eventually did. Davis also supervised numerous tests of the bridges riveted steel structural shapes in the new Engineering Materials Laboratory established in 1931 at Berkeley. The bridge specifications were basically completed by the late fall of 1932, and the federal Reconstruction Finance Corporation agreed to purchase up to $61.4 million in bonds for the bridge construction on Dec. 15, 1932. Actual construction began on July 9, 1933 and the bridge opened to traffic in November 1936.

**Advisory Panel to the State Engineer on Coyote Dam (1934-36)**

 Coyote Dam and Reservoir was the first of six reservoirs approved for construction by voters within the Santa Clara Valley Water District in May 1934. Several of these structures were situtated along or across the Calaveras fault. Acting under the aegis of the states’s new dam safety legislation passed in 1929, the State Engineer was allowed to hire eminent engineers as advisors on technical issues and aspects of any project the state reviewed. Since Coyote Dam lies across the seismically active Calaversas fault, the State Engineer brought in consulting engineer **John D. Galloway** of San Francisco (and a native of San Jose), **Fred C. Herrmann**, former Chief Engineer of the Spring Valley Water Company (which supplied water to San Francisco), and Berkeley Mining and Geology Professor **George D. Louderback**. They reviewed various aspects of the design to provide opinions as to the adequacy of its design for potential fault offset, summarized in their report “***Report on the plans for the Coyote Dam of Santa Clara Valley Water District***,” dated 1935. Other dams built across active faults during that era include **Stony** **Gorge** (1927), **Rodriquez** (1930), and **Morris Dams** (1934).

**Board of Advisory Engineers for California’s Central Valley Project (1937-41)**

In 1933 California voters approved the Central Valley Project Act, which authorized the U.S. Bureau of Reclamation to sell revenue bonds to raise $170 million to construct the largest public works project in the nation’s history, up to that time (the Boulder Canyon Project had cost $165 million). Unable to sell the bonds because of the Great Depression, California turned to the U.S. Bureau of Reclamation to build the project. Because of the Great Depression, between 1934-37 there occurred several transfers of the project’s ownership, between the State of California, Bureau of Reclamation, and Army Corps of Engineers. The first dams and canals of the project started going up in the late 1930s, and the project was expanded so many times, that it wasn’t fully completed until the early 1970s.

A **Board of Consulting Engineers** was appointed by the Bureau of Reclamation in 1937 to provide external review of the first decade of the project, which included: Shasta (Kennet) and Friant Dams, the Delta Cross-Over, Delta-Mendota, Contra Costa, and Friant-Kern Canals. The members included: San Francisco consulting engineer **John D. Galloway** (BSCE 1889 Rose Polytech Inst), Los Angeles consulting engineer **J. B. Lippincott** (BSCE 1887 Kansas), **Fred C. Herrmann**, former Chief Engineer of the Spring Valley Water Co. of San Francisco, **Bernard A. Etcheverry** (BSCE 1902 Berkeley), Professor of Irrigation Engineering at Berkeley (from 1905-51), and San Francisco consulting engineers **Walter L. Huber**, (BSCE 1905 Berkeley) and **Fred H. Tibbetts** (BS 1903, MS 1905 UOP Stockton; BSCE 1904, MS 1906 Berkeley). Tibbetts had previously served as a partner in Haviland and & Tibbetts Civil Engineers and Haviland, Dozier & Tibbetts Construction Co. (1909-17). Tibbetts oversaw much of the early reclamation work on levees in the Sacramento-San Joaquin Valley, between 1909-36.

**Corps of Engineers Airfield Pavement Design Advisory Council (1942-45)**

In June 1941 the Los Angeles District of the U.S. Army Corps of Engineers began wrestling with pavement bearing failures beneath the massive 96-inch diameter tires of the new Douglas B-19 bomber, which weighed 162,000 lbs., spread on just three wheels. The aircraft had caused pavement distress at Clover Field in Santa Monica (where it was built) and at March Army Airfield in Riverside (where it was delivered to the Army Air Corps).

District engineers in Los Angeles quickly consulted with research engineers at the Corps’ Waterways Experiment Station in Vicksburg, MS and it was agreed that an Airfield Pavement Design Advisory Council should be formed, centered around **O. James Porter** (formerly with the California Division of Highways in Sacramento) because of his pioneering role in developing the California Bearing Ratio Test in 1928 (described previously). The advisory council was comprised of Colonel **Henry C. Wolfe** (who had worked on the Fort Peck Dam soil mechanics problems), structures Professor **H.M. Westergaard** of Harvard, and Dr. **Philip C. Rutledge** of Moran, Proctor, Freeman & Meuser, soil mechanics Professor **Arthur Casagrande** of Harvard, **Thomas A. Middlebrooks** (the Corps senior expert in soil mechanics, who had also worked on the Fort Peck Dam landslide), **James L. Land** of the Alabama State Highway Department, and **O. James Porter** of the O.J. Porter Co. of Sacramento.

Through Porter’s urging the advisory council selected the “Stockton Test Track” at the Air Corps’ Stockton Field, about 60 miles south of Sacramento, for the most ambitious field pavement test program ever devised, up to that time. The tests employed a 240,000 lb pneumatic roller passing over pavement sections of varying thickness, stiffness, and consistency, to better evaluate the California Bearing ratio test results for wheel loads of as much as 150,000 pounds.

From these tests, the Army Corps of Engineers developed specialized design procedures for flexible asphalt runways that incorporated the properties of the pavement subgrade, because the aircraft wheel loads are transmitted directly to the subgrade in flexible pavements. This focused attention on the importance of *subgrade compaction*, leading to the **Modified Proctor Compaction Test** of 1946 (described above). These design procedures were subsequently incorporated into post-war design of flexible asphalt highway pavements, which were used in the **Interstate & Defense Highway Program**, beginning in 1955.

**Board of Engineering Consultants to California Department of Water Resources (1956-60)**

 **Walter L. Huber, Chair** (San Francisco consulting engineer), **A. H. Ayers** (San Francisco), **Samuel B. Morris** (retired General Manager & Chief Engineer of LADWP), **Raymond A. Hill** (President of Leeds, Hill & Jewett), and **Ralph A. Tudor** (President of Tudor Engineers of San Francisco). This was the panel of five engineers that oversaw development of the California Water Plan (summarized in DWR Bulletin 3 in 1957), the largest non-federal public works project in American history.

**Earthquake Analysis Board - California State Water Project (1962-77)**

**Dr. Hugo Benioff**, Caltech seismologist (Chair), **Dr. George Housner** (Caltech structural engineer), **Dr. Clarence R. Allen** (Caltech seismologist), **Dr. H. Bolton Seed** (Berkeley geotechnical engineer), **Dr. James L. Sherard** (geotechnical engineer with Woodward-Clyde-Sherard), **Dr. John Blume** (structural engineer, owner J.A. Blume & Assoc), and **Nathan D. Whitman, Jr**. (Whitman, Atkinson & Assoc., structural engineers). Ex-officio State representatives **Alfred R. Golze**, (DWR Chief Engineer), **Laurence B. James** (DWR Chief Geologist), and **Arthur B. Arnold** (DWR Chief, Project Geology, Southern District).

**Earth Dams Consulting Board - California State Water Project (1962-74)**

 **Wallace L. Chadwick** (Los Angeles), **Julian Hinds** (Santa Paula), **Roger Rhoades** (San Francisco), **Dr. Phillip C. Rutledge** (New York City),and **B. E. Terpen**. Rhoades was the lone geologist on this panel.

**Ad hoc Board of Consultants to Parsons-Brinckerhoff-Tudor-Bechtel for the Bay Area Rapid Transit District [BART] (1962-73)**

 This ad hoc board was formulated by the design-build team of Parsons-Brickerhoff/Tudor/Bechtel, to advise them on technical issues during the design and construction of the Bay Area Rapid Transit District’s initial development, from 1962-73. It consisted of: **Ralph B. Peck** (geotechnical engineer, Professor at Univ of Illinois), **Al Matthews** (President of A.A. Matthews Construction Eng’g, Rockville, MD), **Arthur P. Chase,** (structural engineer, VP of Matthews Const Eng’g), **J. Donovan Jacobs** (tunneling expert of Jacobs Associates in San Francisco), and **Wallace L. Chadwick** (expert in heavy construction, retired chief engineer of Southern California Edison,).

The BART project was the first time Terzaghi and Peck’s ***flexible tunnel lining design premise***, formulated from the Chicago Subway measurements in 1940-42, was actually put into practice. The board recommended the use of Soldier Pile Tremie Concrete (SPTC) bulkhead walls for the lower Market Street stations after reviewing Ben C. Gerwick Inc’s pioneering work on the One California Street building in the early 1960s. The biggest challenge for the panel was the Embarcadero Station, which was not part of the original project, but was constructed in the early 1970s and paid for separately, by the City of San Francisco.

**AEG Building Codes Committee (1960-2002)**

 AEG was instrumental in pushing through the Grading and Excavation provisions of the Uniform Building Code through the International Conference of Building Officials, headquartered in Whittier until national consolidation of building codes in 2002. In 1960 AEG formed a national Building Codes Committee chaired by **Douglas R. Brown** of Los Angeles County Department of Building & Inspection. The first San Francisco Section Chair of AEG’s Building Codes Committee in 1962 was **Jo K. Crosby** of Gribaldo, Jacobs & Jones. In the fall of 1962 the committee sent letters to local and county officials in the nine Bay Area Counties concerned with hillside grading operations, inquiring what codes or standards they employed and to solicit their recommendations. In mid-1963 the committee set about drafting a model excavation and grading code that was then circulated to city and county officials for comment.

 AEG’s Building Codes Committee received input for their model excavation and grading code from separate committees formed in the association’s three active sections at the time: Los Angeles, San Francisco, and Sacramento. This input culminated in the preparation of Appendix Chapter 70-Excavation and Grading of 1961, which was submitted with that name for review at CAEG’s annual meeting in Oct 1962, when Slosson was the committee chair. The national Committee Chairs have been **Douglas R. Brown** (1960-62), **Jim Slosson** (1962-64), **Don Michael** (1964-66), **Mike Scullin** (1966-69), **Jack Rolston** (1973-85), **Mike Scullin** (1985-92), **J. David Rogers** (1992-2000), and **Betsy Matheson** (2000-onward).

 A revised version was then submitted to ICBO in Whittier in the spring of 1963 for consideration of inclusion in the 1964 Uniform Building Code (UBC). The ICBO Code Changes Committee was comprised of **Jerry Wilson** from the City of Glendale (chairman), **Ed O’Connor** of the City of Long Beach, Ventura County Building Director **Robert O’Bannion**, and a Mr. **O’Brien**, the Building Director for the City of Thousand Oaks. Non-voting members who attended all of the ICBO meetings included **Doug Brown**, who represented AEG’s national Building Codes Committee and **Mike Scullin**, representing the Los Angeles Section’s Building Codes Committee. The ICBO committee originally envisioned using a mark-up of the revised 1962 Los Angeles County Grading & Excavation Code, but ended up using the draft AEG Code, which was less prescriptive in terms of required engineering geology input, which the committee feared would be rejected by most ICBO members outside of southern California. Surprisingly, the main opposition to the adoption of UBC Appendix Chapter 70 came from structural engineers, not the Building Industry Association (BIA).

 The AEG Building Codes Committee also prepared a brochure titled ***“Recommended Practices for Hillside Grading,”*** which many firms included in their consulting reports and a number of individuals have taken credit for developing. After 1963, revision and improvement of this document was carried out by another committee, described below. In the late 1970s-early 1980s the committee was co-chaired by **Joseph W. Cobarrubias**, CEG and **James P. Krohn**, PE, CEG.

 The most substantive changes made to Chapter 70/33 Appendix Excavation & Grading of the Uniform Building Code occurred in 1967, 1970, 1985, 1991, 1994, and 1997 (which introduced sweeping changes in codifying simplified seismic design procedures in California). The most significant revisions of UBC Appendix Chapter 70 occurred in 1970, when the maximum inclination of fill slopes was dropped from 1.5:1 down to 2:1 (horizontal to vertical). This was because so many failures had occurred in the Jan-Feb 1969 storms, which witnessed sustained rainfall intensities between 0.25 and 1.0 inches/hr. By employing an infinite slope stability analyses, local soil engineers learned that an angle of internal friction of 40 degrees would be required to guarantee short-term stability for the saturated face of a 1.5:1 slope, so they agreed to flatten the slopes to 2:1, which would remain stable with a friction angle of 30 degrees and an assumed cohesion of 100 psf. Everyone seemed comfortable with these figures until the early 1980s, when a number of local jurisdictions in the San Francisco East Bay dropped their maximum slopes to 3:1.

 The substantive additions in the 1990s were ascribable to the 1989 Loma Prieta and 1994 Northridge earthquakes, combined with a down-turn in development in the Los Angeles area, which precluded vociferous objections by the Building Industry Association (BIA), who had opposed proposed code changes during the two previous decades.

**California Geologic Hazards Advisory Committee (1965-67)**

In December 1964 the Resources Agency of the State of California sponsored a two-day ***Earthquake and Geologic Hazards Conference*** in San Francisco, which brought a wide array of experts from across the state to discuss what California’s vulnerability to seismic hazards, in light of the Great Alaska Earthquake of March 1964. In early 1965 the Resources Agency Chief **Hugo Fisher** organized the Califiornia Geologic Hazrads Advisory Committee, to convene and prepare a formal report summarizing what California has accomplished to date, and what recommendations they would have for the State of California to accomplish in the foreseeable future, in regards to mitigating seismic risk.

 The committee was comprised of Caltech Professors **George W. Housner** (structural engineer) and **Clarence Allen** (seismologist), Cal Berkeley Professors **Bruce A. Bolt** (seismology) and **Richard E. Goodman** (geological engineer), **Richard H. Jahns**, Dean of the School of Earth Sciences at Stanford University; **Dennis A. Evans**, Los Angeles consulting geological engineer, **George O. Gates** of the U.S. Geological Survey; **Walter Hahn Jr**., assistant city manager of San Diego; **Mason L. Hill**, exploration manager of Atlantic-Richfield Corp., **Elmer C. Marliave**, Sacramento consuiting geologist; **Jack F. Meelan**, Director of Earthquake Research for the State Division of Architecture and Construction; **Frank E. McClure**, Oakland consulting structural engineer; and **Karl V. Steinbrugge**, earthquake engineer of the Pacific Fire Rating Bureau.

The committee issued their report in June 1967, recommending that the state’s program of urban geological mapping be expanded and accelerated, so that the accumulated information on landslides, soft soil subsidence, and other potential geologic hazards should be made available to the public. They also recommended that the state developing a clearing house for information pertinent to earthquake and geologic hazards. Recommendations were also made to develop a program of research to study the physical behavior of potentially hazardous soils (Goodman had just published an article in the GSA Bulletin about the magnification of seismic energy in relatively young depositional basins, like Los Angeles). The existing seismographic networks then operated by Berkeley and Caltech should be expanded and adapted to telemetering of earthquake motions to a central point of dissemination, which will immediately inform interested state agencies. The report encouraged a wide disseminagtion of seismic instruments throughout the state, to record ground and building motions during earthquakes. It also recommended that the State should launch a program of earthquake education directed toward geologists, engineers, architects, building officials, contractors, and the 'informed public.

**Board of Consultants to the Bay Conservation and Development Commission (1965-70)**

 **Dr. Bruce A. Bolt** (seismologist UC Berkeley), **Lloyd S. Cluff** (engineering geologist Woodward-Clyde), **Henry J. Degenkolb** (structural engineer H.J. Degenkolb & Assoc), **George O. Gates** (USGS Menlo Park), **Frank E. McClure** (structural engineer McClure & Messenger), **William W. Moore** (geotechnical engineer Dames & Moore), **Dr. Gordon B. Oakeshott** (engineering geologist and Deputy Chief Calif Div of Mines & Geology), Colonel **Henry E. Pape, Jr.** (SF District Engineer, Corps of Engineers), **Dr. H. Bolton Seed** (geotechnical engineer UC Berkeley), **George P. Simonds** (architect UC Berkeley), **Karl V. Steinbrugge** (structural engineer Pacific Fire Rating Bureau), **Richard J. Woodward**, Jr (geological engineer, Woodward Clyde).

 This board advised the State of California BCDC regarding the safety of fills along the margins of San Francisco Bay and its natural estuaries (summarized in CDMG Special Report 97 in 1969). **Mike Praszker** never got over the fact that he was not included in this panel, since he and Charles Lee had “*written the definitive work*” on the impact of the San Francisco Bay Mud on structures (in CDMG Special Report 97, released in 1969). Mike Praszker had a running feud with Woodward Clyde, which culminated in a defamation lawsuit he filed against the firm in the 1970s.

**State Board of Registration for Geologists and Geophysicists (1969-2009)**

 The first Board of Registration for Geologists and Geophysicists (BRGG) was comprised of: **Wilfred W. Peak** (Chairman), **Ted L. Bear** (Vice Chair), **Glenn A Brown, Prof. Ian Campbell, Joseph M. Crosby** (public member), **John F. Curran**, and **Gardner M. Pittman**. The first executive officer was **John E. Wolfe**, RG who served for over 20 years. Peak worked for the Department of Water Resources’ Division of Safety of Dams. Peak was succeeded by former State Geologist Dr. **Ian Campbell** in July 1972. In 2009 the BRGG was absorbed into the Board for Registration for Professional Engineers and Land Surveyors (BORPELS), as a cost-saving measure. On January 1, 2011 the name was changed to the Board for Professional Engineers, Land Surveyors and Geologists.

**Redwood City Seismic Advisory Board (early 1970s)**

 In the early 1970s Redwood City appointed a special Seismic Advisory Board to review the engineering aspects of the Redwood Shores project. This board issued several reports and was comprised of: Prof. **Richard H. Jahns**, CEG (Stanford), Prof. **Bruce A. Bolt**, RGP (Berkeley), Prof **Ray W. Clough**, (Berkeley), **Henry J. Degenkolb**, SE (consultant), and **Thomas M. Leps**, PE (consultant). They reported to **Jim Fales**, the City Manager and the general improvement district project manager.

**California Seismic Safety Commission (1975 onward)**

The **Governor’s Earthquake Council** was set up as part of the Seismic Safety Act of 1971, following the San Fernando earthquake. At the bequest of State Geologist Jim Slosson and others, Governor Edmund G. Brown, Jr. signed legislation establishing the **California Seismic Safety Commission** in August 1975. The first commission was chaired by Berkeley Professor **H. Bolton Seed** and included former State Geologist Dr. **James E. Slosson**, Berkeley seismologist Professor **Bruce A. Bolt**, Stanford Earth Science Dean **Richard H. Jahns**, and consulting geotechnical engineer **L. Leroy Crandall** of Los Angeles. From 1985-95 the board’s executive director was **L. Thomas Tobin**, PE (BSCE ’64 Berkeley; MS ‘72 SJSU). **Jim Slosson** served two terms on the commission, in 1975-78 and again, in 1991-99; while geologist **Lloyd Cluff** served 16 years on the commission, including terms as Vice Chairman and twice as Chairman (in 1988-90 and 1997-99).

**Special Consulting Board for the Oroville Earthquake (1975-79)**

 Following the M5.7 Oroville Earthquake of Aug. 1, 1975 a special board of consultants, initially termed the “**Consulting Board for Earthquake Analysis**,” was formed by the California Department of Water Resources and chaird by Berkeley Prof. **Harry B. Seed**. This board evaluated the information being collected in the wake of the quake. Their role gradually expanded to later encompass a series of independent analyses of DWR’s existing hydraulic structures in vicinity of Oroville, and the group was renamed the “**Special Consulting Board for the Oroville Earthquake**” in 1976. They periodically met to review ongoing efforts to evaluate DWR’s existing structures, and make suggestions how these could be evaluated for dynamic loading and retrofitted to better resist earthquake-induced damage. The board consisted of: **Clarence R. Allen** (Prof of Seismology at Caltech), **John A. Blume** (Chief Eng’r J A Blume & Associates), **Bruca A. Bolt** (Prof of Seismology at Berkeley), **Wallace L. Chadwick** (former Chief Engineer of SCE), **George W. Housner** (Prof of Structural EQ Eng’g at Caltech), **Thomas M. Leps** (Chief Engineer Leeds, Hill & Jewett), **Alan L. O’Neill** (fmr Chief Geologist of DWR), **Philip C. Rutledge** (Princpal Mueser Rutledge), and **H. Bolton Seed** (Prof Geotech EQ En’g at Berkeley).

**Independent Panel of Geological and Engineering Consultants to assess Auburn Dam (1976-79)**

 Following the March 1977 M 5.7 Oroville Earthquake a five-member board appointed by the U.S. Bureau of Reclamation in July 1976 to guide and review the investigations and findings. They included: Seismologist Professor **Clarence R. Allen** of Caltech; structural engineering Professor **Ray Clough** of Berkeley; Stanford Dean of Earth Sciences **Richard H. Jahns**; geophysics Professor **Lane Johnson** of Berkeley; and **J. Laginha Serafim**, former head of the Dams Section of the Studies of Structures at the National Laboratory of Civil Engineering (LNEC) in Lisbon.

**Consulting Board for Earthquake Analysis for Auburn Dam (1977-80)**

 In response to heated criticism of the proposed doubly-curved thin arch design for the Auburn Dam site, the State Department of Water Resources established a six member board of consultants to analyze appropriate earthquake motions for the dam site by the U.S. Bureau of Reclamation. This board was chaired by Caltech earthquake engineering Professor **George Housner**, and included: Berkeley Professor **H. Bolton Seed** (geotechnical earthquake engineer), structural earthquake engineer **Dr.** **John A. Blume,** and engineering geologists **Douglas D. Campbell** (of Dolmage, Campbell & Associates in Vancouver, BC) and **Alan L. O’Neill**, CEG (former Chief, Project Geology Branch of DWR). This board reviewed all of the work performed by USBR and its consultant, Woodward Clyde Consultants, the USGS, as well as studies by the CDMG, DWR, State Department of Conservation, and the Division of Safety of Dams.

The DWR Consulting Board recommended that the proposed Auburn Dam be designed for a surface displacement of 13 cm. The displacement might occur on a single fault or be distributed over a zone of faulting. In the final design specified by the Secretary of Interior, 23 cm of normal-oblique displacement was selected for selected foundation features. In the event of a new dam, investigations for active faulting in the dam foundation would be mandatory.

**Board of Consultants-Seismotectonic Evaluation of San Luis Dam (1981-83)**

 On September 14, 1981 approximately 1,300,000 cubic yards of the Zone 3 random fill in the upstream shell of the San Luis Dam began sliding into San Luis Reservoir (the dam is 18,600 ft long with a volume of 80 million yds3). The slide floored in colluvial deposits of lean to fat clay. Emergency repairs were initiated in December 1981, consisting of a 2,100 ft long stability berm, involving 1,670,000 yds3 of material. Three additional berms, comprising another 1,527,000 yds3, were placed in other areas to bolster the dam’s stability where the embankment was founded on thick deposits of colluviums. This corrective work was carried out by Peter Kiewit & Sons and completed in early 1983.

As part of the Bureau of Reclamation’s Safety Evaluation of Existing Dams Program, a comprehensive seismotectonic investigation was conducted in late 1981 to re-evaluate the earthquake loads on the dam and the dam’s ability to withstand these loads. The Bureau of Reclamation’s Engineering & Research Center in Denver appointed a board of consultants to examine these issues: Professors **H. Bolton Seed** and **Bruce A. Bolt** of U.C. Berkeley, and **William F. Marcuson, III**, PE, Director of the Geotechnical Laboratory at the USACE-WES in Vicksburg.

**NRC Committee on Ground Failure Hazards (1983-90)**

 The **Committee on Ground Failure Hazards** was established in May 1983 by the National Research Council in concert with the National Academies in Washington, DC. It was formed in response to the economic losses incurred by landslides, erosion, and debris flows that plagued California, Utah, and Arizona between 1980-83. The stated purpose of the committee was to bring the resources of the entire scientific and technical community to bear on scientific and technical questions of national importance through the voluntary advisory committee.

 The 12 members appointed to the committee were: Prof. **Dwight A. Sangry** of Carnegie-Mellon Univ: Utah State Geologist **Genevieve Atwood**; **Don U. Deere** of Univ Illinois; Los Angeles County Geologist **Arthur G. Keene**, **F. Beach Leighton** of Leighton & Associates, Planner **George G. Mader** of Spangle & Associates in Portola Valley, Prof, **Norbert Morganstern** of the Univ of Alberta, **David B. Prior** of LSU’s Coastal Studies Institute, Hydrogeologist **Irwin Remson** of Stanford, **Robert L. Schuster** of the USGS Engineering Geology Branch, **Douglas N. Swanston** of the US Forest Service, and Prof. **Barry Voight** of Penn State (four of the 12 members were from California).

 For about three years (1984-86) **Art Keene** served as the Editor of ***Ground Failure***, the flagship publication of the Committtee on Ground Failure Hazards. It was a 16-page serial publication that summararized current research efforts, conferences, publications, and summaries of various ground failure hazards across the USA, including the impacts of settlement and expansive soils. Unfortunately, the funding for this was soon cut and the publication died almost as fast at it appeared.

 The committee was instrumental in helping efforts to sponsor special sympoisia on landslides and debris flows at the 1984 GSA annual meeting in Reno and the 1986 Cordilleran Section Mtg in Los Angeles, among others. Much of the research and lessons learned were summarized in a series of article published im GSA’s ***Reviews in Engineering Geology***, beginning with Vol 7 in 1987, which summarized the debris flow sessions at the 1984 symposium in Reno. This was followed by Vol 8 on Neotectonics in 1990, and Vol. 9 on Landslides and Landslide Mitigation in 1992.

**Technical Advisory Group on the Santa Cruz Geologic Hazard Investigation** **(1990-91)**

 Shortly after the October 17, 1989 M 6.9 Loma Preita Earthquake a Technical Advisory Group (TAG) was created to evaluate whether building permits should be issued to residemnts in the Santa Cruz Mointains underlain by “anciuent landslides,” many of which partiaally reactivated during the quake. The group was established with $1.35 million in funding from the Federal Emergency Management Agency to provide “technical input” to FEMA, operating under the auspices of the Army Corps of Engineers San Francisco District. The effort was requested by Santa Cruz County, who noted that ovber $100 million worth of properties were at-risk for landslide related issues.

 The group was originally comprised of: **Brian Walls**, geological engineer with the Corps of Engineers (manager); **Gary B. Griggs**, CEG, Professor of Geology at UC Santa Cruz; **David K. Keefer** (report editor), **Ray C. Wilson**, and **Edwin L. Harp** of the US Geological Survey, engineering geologist **Gerald E. Weber**, CEGof Weber & Associates, Corps of Engineers geologist **Colin C. McAneny**, geologist **Paia Levine** with the Santa Cruz County Planning Department, and engineering geologist **Thomas E. Spittler**, CEG with the California Division of Mines & Geology. The group met in closed sessions, which angered many of the Santa Cruz Mountains residents, who hired their own geologist to sit in on the board meetings for a time. Because of these political pressures, Brian Walls and Ray Wilson resigned from the group, and Walls’role as the group manager was assumed by **Arijs Rakstins** of the Corps of Engineers. In the fall of 1991 the advisory group co-authored a 405-page report titled “***Geologic Hazards in the Summit Ridge Area of the Santa Cruz Mountains, Santa Cruz County, California, evaluated in response to the October 17, 1989, Loma Prieta Earthquake: Report of the Technical Advisory Group***,” prepared for FEMA and published as U.S. Geological Survey Open File Report-91-618. Other contributors to this report included **John M. Andersen**, **Mary Ellen Hynes**, and **H. M. Taylor** of the Corps of Engineers WES in Vicksburg, MS, and **Jeffrey M. Nolan** of Weber and Associates.

**San Pablo Dam seismic upgrade review boards (2003-09)**

 **James K. Mitchell**, **Robert M. Pyke**, **Donald H. Babbitt**, **Izzat M. Idriss**, **Raymond B. Seed**, **Ross Boulanger**, **Peter G. Nicholson**, and **Mansour Tabatabaie** reviewed various phases of the seismic retrofit design and construction for the East Bay Municipal Utility District as members of two separate review boards.

**Independent Review Panel to the California Department of Water Resources (2007)**

 Independent panel chaired Dr. **Gerald E. Galloway Jr.**, PE of the University of Maryland, Dr. **John J. Boland**, PE, Johns Hopkins University, Dr. **Raymond J. Burby**, FAICP, of the University of North Carolina-Chapel Hill, **Christopher B. Groves**, GE, Shannon & Wilson Inc., St. Louis, MO, **Susan Lien Longville**, Water Resources Institute at Cal State San Bernardino, Dr. **Lewis E. Link, Jr.**, University of Maryland, Dr. **Jeffrey F. Mount**, U. C. Davis, Dr. **Jeff Opperman** of The Nature Conservancy, Dr. **Raymond B. Seed** of U. C. Berkeley, **George L. Sills**, PE, U.S. Army Engineer Research and Development Center-Vicksburg, **James J. Smyth**, PE, Smyth Water Planning Solutions, Raleigh, NC, **Ronald Stork** of Friends of the River, and **Edward A. Thomas**, Esq., Association of State Floodplain Managers.

The panel was assisted by **Joseph D. Countryman**, PE of MBK Engineers in Sacramento, **Peter C. Wijsman** of MSC, The Netherlands Water Partnership in Rotterdam, **Larry Larson**, PE, CFM and **Doug Plasencia**, PE, CFM of the Association of State Floodplain Managers, **Piet T.M. Dircke**, Msc of the University of Rotterdam, and three people from PBS&J: **Jennifer Marcy**, CFM, Senior Scientist, **Michael DePue**, PE, CFM, D. WRE, Senior Program Manager, **William Hinsley**, Associate Vice President, Senior Project Director.

This group prepared a comprehensive report titled: ***A California Challenge-Flooding in the Central Valley, A Report to the Department of Water Resources, State of California***, dated October 15, 2007. This report was intended to serve as the blueprint for the desired provision of flood protection for California’s Central Valley Region in the 21st Century.

**Independent Consulting Board-FloodSAFE California Program (2008-)**

 In 2008 an independent review board was named by the California Department of Water Resources to provide expert review of geotechnical policies and procedures with regard to safety, performance, state-of-practice, and economy. Members are **Christopher B. Groves**, GE of Shannon & Wilson (Chair), Prof. **Raymond B. Seed** of U.C. Berkeley, and **George L. Sills**, PE, retired from the U.S. Army Corps of Engineers ERDC-Vicksburg.

 In 2009 this panel was expanded to include geotechnical engineers Dr. **Alfred J. “Skip” Hendron**, PE (Professor Emeritus at Univ of Illinois) and Dr. **William F. Marcuson, III**, PE (Director Emeritus of the Geotechnical Laboratory at ERDC-Vicksburg). The panel’s charge is to provide expert technical oversight with regard to: safety, performance, state-of-practice, and economy of flood protection systems, and to advise CA DWR on analytical methods and design criteria.

**Independent Board of Consultants (IBC) for Oroville Emergency Recovery-Spillways (2017)**

 In early February 2017 a series of storms impacted the Feather River watershed, with inflows exceeded 100,000 cfs. The underground powerhouse was only capable of releasing 13,000 cfs, resulting in a rapid filling of the reservoir. When the reservoir pool rose to elev. 813.6 ft, the submerged service spillway (eight radial gates, with a maximum capacity of 277,000 cfs) was opened, initially releasing about 12,000 cfs and increasing to 40,000 cfs. By Feb 7th, a large hole developed in the floor of the service spillway chute, hastened by erosion of weathered saprolite developed upon the Smartville ophiolite. By Feb 11th, the reservoir rose to its maximum design level of Elev 902 ft, allowing discharge over a 1000 ft long emergency spillway (ogee crested weir), which had never previously been used since the dam;’s completion in 1968. The weathered saprolite was rapidly eroded by the overflow, and at 4 PM on Feb 12th an evauation order was issed for the communites immediately downstream, as far as Yuba City and Linda/Olivehurst to evacuate approximately 188,000 residents. Discharge through the service spillway was increased to as much as 140,000 cfs to reduce the flowage over the emergency spillway, which resulted in the rapid erosion of ~275,000 yds3, beneath and adjacent to the lower spillway chute. This included ~170,000 to 225,000 yds3 of rock deposited in the Feather River, raising the tailwater about 9 ft, temporaily shuting down the powerplant.

 On Feb 17th DWR began forming an external Board of Consultants for the Oroville Dam Spillway project. Those members were **Kerry Cato**, Ph.D., CEG, **John J. Cassidy**, Ph.D., P.E., **Eric Kollgaard**, P.E, **Faiz Makdisi**, Ph.D., P.E., D.GE, and **Larry Nuss**, P.E. Their first Memorandum was issued on March 10th. Messers Cassidy and Nuss stepped down from the board in April and were replaced by **Paul G. Schweiger**, PE and **John K. Egbert**, PE in mid-May. The first Memorandum (No. 7) issued by the Board without significant redaction was on May 31, 2017. In the board’s fix six memos CA DWR maintained that the board’s memos contained “critical energy infrastructure information,” which allowed them to redact portions of the memos.

**Independent Forensic Review (IFR) of the Oroville Dam Spillway (2017-18)**

 In response to a request from the Federal Energy Regulatory Commission, on March 15, 2017 CA DWR announced that it selected six members of the United States Society of Dams or the Association of State Dam Safety Officials to form an independent forensic team, supported by four technical specialty experts. These individuals were: **John France**, PE geotechnical engineer and team leader; **Hank Falvey**, DIng, PE for hydraulics; **John Trojanowski**, PE for hydraulic structures, **Irfan Alvi**, PE for operations/human factors, **Steve Rigbey**, PEng of BC Hydro for operations, and **David K. Rogers**, PE, CEG for engineering geology. On May 3rd Rogers was replaced by Dr. **Peter A. Dickson**, PG of Harza Consultants as the engineering geologist. On January 5, 2018 the team issued their report, titled “***Independent Forensic Team Report, Oroville Dam Spillway Incident***,” which was 584 pages in length.

The four specialty experts named were **Dan Hertel**, PE for general civil/dam construction, **Erik Bollaert** for scour and erosion, **Anton Schleiss** for hydraulics, and **Sultan Alam** for hydraulics. None of these experts were registered to practice engineering (PE) or geology (PG) in California.

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