DECLARATION OF BRIAN SCHROTH

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I, Brian Schroth, declare:

1. I am employed by CH2M HILL, Inc., as a Senior Technologist. My resume is attached to this Declaration as Exhibit A. Pacific Gas and Electric Company engaged CH2M HILL to assist it in connection with issues surrounding the chromium plume in Hinkley, California. I was asked to analyze the presence of naturally-occurring hexavalent chromium in California's Mojave Desert.

2. I have been working on these issues since 2007. I am currently registered in California as a Professional Geologist and Certified Hydrogeologist. I attended the University of California at Berkeley, receiving a Ph.D. in soil science with an emphasis in environmental geochemistry. This was preceded by a masters of science degree in hydrology/hydrogeology from the University of Nevada at Reno, and a bachelors of science degree in geology from San Diego State University. I have over nineteen years of experience in consulting and applied academic work focusing on groundwater and geochemistry, including eight years assessing the geochemistry and hydrogeology of sites in the Mojave Desert and the surrounding area.

3. My opinions are that:

(a) Naturally-occurring hexavalent chromium is ubiquitous in groundwater systems throughout the Mojave Desert and globally, with naturally-occurring concentrations sometimes exceeding 50 µg/L in alluvial aquifers in the western Mojave Desert[1] and elsewhere in central and southern Arizona,[2] and western New Mexico.[3] The ability of manganese dioxides,

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[1] Izbicki, James A., Ball, James W., Bullen, Thomas, D., Sutley, Stephen J., 2008, "*Chromium, Chromium Isotopes, And Selected Trace Elements, Western Mojave Desert, USA.*," Applied Geochemistry 23: pages 1325-1352. http://ca.water.usgs.gov/news/Chromium-report.pdf; Izbicki, J.A., 2008, "*Chromium Concentrations, Chromium Isotopes, And Nitrate In The Unsaturated Zone And At The Water-Table Interface, El Mirage, California*," Cooperative Water Resources Study submitted to Lahontan Regional Water Quality Control Board, December, 2008.

[2] Robertson, F.N., 1975, "Hexavalent Chromium In The Ground Water,Iin Paradise Valley, Arizona," Ground Water 13, 516–527.; Robertson, F.N., 1991, "*Geochemistry Of Ground Water In Alluvial Basins Of Arizona And Adjacent Parts Of Nevada, New Mexico, And California*," U.S. Geol. Surv. Prof. Paper 1406-C.

common in desert environments, to oxidize Cr(III) to Cr(VI) is well established.[4] Thus, both the mechanism of natural production of Cr(VI) and the widespread presence of naturally-occurring Cr(VI) in groundwater is well documented.

(b) Concentrations of naturally-occurring Cr(VI) vary significantly geographically, vertically and laterally in aquifer systems due to many factors, including the geochemical conditions present[5] and the composition of earth material sources.[6]

(c) Concentrations of Cr(VI) detected in wells are naturally variable over time at any given well. As a result, increases or decreases in the concentration of Cr(VI) at a given well do not necessarily signify the arrival or departure of a particular source or plume of Cr(VI).

4. My opinions are supported by the following information from published studies by the United States Geological Survey ("USGS"), data from the California Department of Public Health ("CDPH") and California Department of Health Services ("CA DHS"), the California State Water Resources Control Board ("SWRCB"), and consumer confidence reports

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[3] Robertson, F.N., 1991, "*Geochemistry Of Ground Water In Alluvial Basins Of Arizona And Adjacent Parts Of Nevada, New Mexico, And California*," U.S. Geol. Surv. Prof. Paper 1406-C.

[4] Bartlett, R. and James, B., 1979, "*Behavior Of Chromium In Soils: III Oxidation*," J. Environ Qual., 8, 31–35; Eary, L.E., and Rai, D., 1986, "*The Kinetics Of Cr(VI) Reduction To Cr(III) By Ferrous Iron-Containing Solids*," Geol. Soc. Am. Abstr. Programs, 18, 6, 591; Fendorf, S.E., and Zasoski, R.J., 1992, "*Chromium (III) Oxidation By δ-MnO2. 1. Characterization*," Environ. Sci. & Technol., 26, 1, 79–83.

[5] Ball, J.W., and Izbicki, J.A., 2004, "*Occurrence Of Hexavalent Chromium In Ground Water In The Western Mojave Desert, California*," Applied Geochemistry, Vol. 19, pp. 1123-1135; Izbicki, J.A., 2008, "*Chromium Concentrations, Chromium Isotopes, And Nitrate In The Unsaturated Zone And At The Water-Table Interface, El Mirage, California*," Cooperative Water Resources Study submitted to Lahontan Regional Water Quality Control Board, December, 2008; Izbicki, James A., Ball, James W., Bullen, Thomas, D., Sutley, Stephen J., 2008, "*Chromium, Chromium Isotopes, And Selected Trace Elements, Western Mojave Desert, USA.*," Applied Geochemistry 23: pages 1325-1352. http://ca.water.usgs.gov/news/Chromium-report.pdf.

[6] Chromium occurs naturally in the earth's crust, with an average concentration of 100 mg/kg, and has been found in rock-forming minerals of the San Gabriel Mountains at concentrations up over 1,000mg/kg. (Izbicki, *et al.*, 2008.) Detectable concentrations of Cr(VI) occur naturally in alkaline groundwater (pH greater than 7.5) with dissolved oxygen greater than 0.5 milligrams per liter in alluvial aquifers in the western Mojave Desert. (Izbicki, *et al.*, 2008.) Cr(III) oxide is among the ten most abundant elements compounds in the earth's crust. Crustal rock on earth contains an average of 140 parts per million of chromium; seawater contains 0.6 μg/L and stream water contains 1.0 μg/L. (Guertin, *et al.*, 2004.)

for numerous water supply companies in the Mojave Desert. See the Table 1 attached to this Declaration as Exhibit B.

5. Drinking water quality data collected by the CDPH and the USGS and others confirm that Cr(VI) is present in groundwater throughout California, including the Mojave Desert area. Table 1 summarizes numerous published studies and drinking water supply reports for the Mojave Basin evaluating Cr(VI) and/or total chromium concentrations in groundwater. These studies were reviewed to assess the range and average concentrations of naturally-occurring chromium in groundwater.

6. In typical groundwater systems nearly all of the dissolved chromium present is in the Cr(VI) form, with a much smaller fraction in the trivalent form of chromium.[7] Cr(III) is the most common form of chromium found in rocks and soil and is highly insoluble and, thus, not generally present in the dissolved phase in groundwater. Therefore, although some of the studies reviewed only analyzed for Cr(T), it can be inferred that dissolved Cr(T) in most groundwater systems primarily consists of Cr(VI).

7. Results of the drinking water supply reports and others referred to below are consistent with scientific studies conducted by the USGS that have identified the presence of naturally-occurring Cr(VI).[8] The frequency of reports of naturally-occurring Cr(VI) has risen over recent years. This is primarily the result of the CA DHS mandating the use of lower analytical detection limits.

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[7] Ball, J.W., and Izbicki, J.A., 2004, "*Occurrence Of Hexavalent Chromium In Ground Water In The Western Mojave Desert, California*," Applied Geochemistry, Vol. 19, pp. 1123-1135.

[8] Izbicki, James A., Ball, James W., Bullen, Thomas, D., Sutley, Stephen J., 2008, "*Chromium, Chromium Isotopes, And Selected Trace Elements, Western Mojave Desert, USA*.," Applied Geochemistry 23: pages 1325-1352. http://ca.water.usgs.gov/news/Chromium-report.pdf; Izbicki, J.A., 2008, "*Chromium Concentrations, Chromium Isotopes, And Nitrate In The Unsaturated Zone And At The Water-Table Interface, El Mirage, California*," Cooperative Water Resources Study submitted to Lahontan Regional Water Quality Control Board, December, 2008; Robertson, F.N., 1991, "*Geochemistry Of Ground Water In Alluvial Basins Of Arizona And Adjacent Parts Of Nevada, New Mexico, And California*," U.S. Geol. Surv. Prof. Paper 1406-C; Schmitt, S.J., Milby Dawson, B.J., and Belitz, K., 2008, "*Groundwater-Quality Data In The Antelope Valley Study Unit, 2008: Results From The California GAMA Program*," United States Geological Survey. Data Series 479.

8. Notable findings of the literature review showing site-specific chromium levels throughout California are summarized below (see Exhibit B for additional details and references):

(a) The CDPH produced a plot of Cr(VI) detections in groundwater, attached to this Declaration as Exhibit C, that confirms and illustrates that Cr(VI) is ubiquitous in California groundwater, including the Mojave Desert area. Data compiled by the CDPH shows that Cr(VI) was reported greater than the 1 μg/L detection limit in over half of the groundwater supply wells that were tested (3,156 out of 5,943 between 1997 and 2008).[9] The three counties in California with the greatest number of wells containing Cr(VI) concentrations exceeding 1 μg/L were Fresno, Los Angeles, and San Bernardino.

(b) The printout of data from the SWRCB Geotracker attached to this Declaration as Exhibit D provides a printout of data from the SWRCB Geotracker database that shows many water supply wells in the Mojave Desert area with concentrations of Cr(VI) greater than 1 μg/L.[10]

(c) A study of groundwater conducted by the USGS and SWRCB in the Mojave area in 2008 also confirmed that Cr(VI) is present in groundwater at concentrations up to 16 μg/L.[11] Consistent with the SWRCB data, the USGS reported Cr(VI) concentrations ranging from 1 to 16 μg/L in 15 out of 22 well samples analyzed. Exhibit E to this Declaration shows the distribution of Cr(VI) detected throughout the Mojave Area.

(d) Annual water quality reports for drinking water supply companies were also reviewed. In reports where Cr(VI) was reported, municipal supply wells extracting water

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[9] State Water Resources Control Board Division of Water Quality GAMA Program, 2009, Groundwater Information Sheet Chromium VI. September. http://www.swrcb.ca.gov/water_issues/programs/gama/docs/coc_hexchromcr6.pdf

[10] State Water Resources Control Board Division of Water Quality GAMA Program, 2011, Groundwater Ambient Monitoring & Assessment Program, accessed on July 6, 2001. http://www.swrcb.ca.gov/water_issues/programs/gama/geotracker_gama.shtml.

[11] Mathany, Timothy M., and Belitz, K., 2008, "*Groundwater Quality Data In The Mojave Study Unit, 2008: Results From The California GAMA Program*," http://pubs.usgs.gov/ds/440/.

from the Alto and Este sub-basins of the Mojave River Basin show the presence of naturally-occurring Cr(VI).

(i) In the Victorville area, thirty-five miles southeast of Hinkley, reports for drinking water supply wells extracted from the Alto and Este sub-basins of the Mojave River Basin indicated detectable Cr(VI) in three areas.[12] The average Cr(VI) concentrations were: 5.1 μg/L (range 5 to 5.1 μg/L) in the Desert View System, 2.5 μg/L (range non-detect ("ND") to 6.3 μg/L) in Apple Valley South, and 2.7 μg/L (range ND to 4.6 μg/L) in Lucerne.

(ii) The Twentynine Palms Water District (located approximately 100 miles southeast of Hinkley) extracts groundwater from four sub-basins. In 2009, an average Cr(VI) concentration of 6 μg/L was detected with a range from ND to 29 μg/L.[13]

(e) A USGS groundwater investigation of the Joshua Tree and Copper Mountain sub-basins reported a median naturally-occurring Cr(VI) concentration of 13 μg/L.[14]

(f) Groundwater investigation of the Cadiz and Fenner Valleys reported naturally-occurring Cr(VI) concentrations ranging from 15 to 26 μg/L.[15]

(g) A study of naturally-occurring Cr(VI) concentrations in groundwater from approximately 200 public supply, irrigation, and observation wells in the western Mojave Desert indicated a median Cr(VI) concentration of 7 μg/L, with a range of 0.2 to 60 μg/L.[16]

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[12] Golden State Water Company, 2010a, "*Water Quality Report: Apple Valley South Water System*," http://www.gswater.com/csa_homepages/documents/AppleValleySouth061110.pdf; Golden State Water Company, 2010a, "*Water Quality Report: Barstow Water System*," http://www.gswater.com/csa_homepages/documents/Barstow061110.pdf; Golden State Water Company, 2010b, "*Water Quality Report: Desert View Water System*,"http://www.gswater.com/csa_homepages/documents/DesertView061110.pdf; Golden State Water Company, 2010c, "*Water Quality Report: Lucerne Water System*."

[13] Twentynine Palms Water District, June 2010, "*2009 Consumer Confidence Report*," http://www.29palmswater.org/pdf/Consumer_Confidence_Report_2009.pdf.

[14] Nishikawa, Tracy, Izbiki, John A., Hevesi, Joesph A., Stamos, Christina L., and Martin, Peter, 2004, "*Evaluation Of Geohydraulic Framework, Recharge Estimates, And Ground-Water Flow Of The Joshua Tree Area, San Bernardino County, California*."

[15] Metropolitan Water District of Southern California and Bureau of Land Management. September 13, 2001, "*Final Environmental Impact Report Final Environmental Impact Statement Cadiz Groundwater Storage And Dry-Year Supply Program, San Bernardino County, California*."

9. Groundwater quality records collected by the CDPH show that concentrations of Cr(VI) detected in water supply wells vary considerably over time at any given well.[17] As a result, increases or decreases in the concentration of Cr(VI) at a given well do not always signify the arrival or departure of a particular source or plume of Cr(VI). Rather, these changes may be expected as a result of other factors, including sample collection procedures, seasonal changes, changes in well operation, laboratory analysis, variations in annual precipitation, and other factors.

10. Groundwater data collected by the CDPH in the Mojave area show that the concentrations of Cr(VI) at these wells typically fluctuate over time.[18] Exhibits F and G to this Declaration illustrate changes in Cr(VI) concentrations measured over time in several wells in the Mojave area. On these figures, the highest concentration of Cr(VI) detected at each water supply well (or well cluster) is shown. In addition, plots of concentrations of Cr(VI) over time for select wells within a well cluster are shown. As shown on these charts, it is common for the concentration of Cr(VI) to vary in a random pattern around a naturally-occurring background value.

11. Other water quality records compiled by the CDPH corroborate the variability in the concentrations of Cr(VI) detected at individual water supply wells in the Mojave area over time.[19] A review of results for hundreds of water supply wells in San Bernardino County indicates that chromium is often present above the laboratory reporting limit of 1 μg/L, and that Cr(VI) concentrations are often variable. For example, concentrations of Cr(VI) detected in Hesperia Water District well 15-A have ranged from 2.6 to 7.93 μg/L. Similar concentration ranges were reported for Victor Valley Water District well 208 (Cr(VI) ranging between 4.2 and

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[16] Ball, J.W., and Izbicki, J.A., 2004, "*Occurrence Of Hexavalent Chromium In Ground Water In The Western Mojave Desert, California*," Applied Geochemistry, Vol. 19, pp. 1123-1135.
[17] California Department of Public Health, 2011, "*Chromium-6 in Drinking Water Sources: Sampling Results*," Web page accessed on 7/6/2011. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Chromium6sampling.aspx
[18] *Id.*
[19] *Id.*

9.5 µg/L). The Loma Linda University Anderson Well 2 reported a Cr(VI) range of 1.3 to 5.4 µg/L, while Anderson Well 3 has a reported Cr(VI) range from 2.0 to 4.5 µg/L.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this Declaration was executed on July 10, 2011, at Sacramento, California.

Brian Schroth

Brian Schroth

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EXHIBIT A

Brian K Schroth, Ph.D., P.G., C.Hg.

Senior Geochemist/Hydrogeologist

Education

Ph.D., Soil Science, University of California, Berkeley
Emphasis: Environmental Geochemistry
M.S., Hydrogeology, University of Nevada Reno
B.S., Geology, San Diego State University

Professional Registrations

Professional Geologist, California, No. 7423
Certified Hydrogeologist, California, No. HG 793

Distinguishing Qualifications

Dr. Schroth is a senior geochemist with over 19 years of experience in consulting and applied academic work. His expertise is centered on trace metal geochemistry, and has also strong knowledge of geochemical reaction path modeling, fate and transport of organic chemicals, and stable isotope geochemistry. His published research has focused on the potential effects of organic compounds present in landfill waste on the fate and mobility of trace metals in groundwater. He combines geochemistry with his strong background in hydrogeology, groundwater modeling, and soil science to help define fate and transport pathways in the environment. Dr. Schroth has emloyed the use of geochemical data on several projects with the goals of identifying different sources of contaminants, performing water balances, and defining and monitoring contaminant flowpaths. In water supply and subsurface water storage applications, Dr. Schroth has used geochemical modeling software to predict potentially harmful reactions (such as well clogging or the release of undesireable metals to groundwater), as well as to propose treatment options to prevent such reactions.

Relevant Experience

U.S. Department of Energy, Hanford Facility, Richland, WA, 2011
Dr. Schroth was the lead author for the Remedial Investigation report that focused on uranium-impacted soil and groundwater. He summarized a complex body of research and interpreted recently-collected data to describe the mechanisms of uranium leaching, vadose-zone transport, and groundwater mobility in a near-river environment. The fluctuating river level creates changes in geochemical conditions, which in turn affect the mobility of uranium. Dr. Schroth used his knowledge of hydrogeology and trace metal geochemistry to identify the key properties and assumptions involved in predicting mobility in this complex environment.

Shell Canada Scotford Facility, Alberta, Canada, 2010

Dr. Schroth combined data from several different waste streams at a water quality upgrading facility and modeled the potential precipitation reactions that could occur both on the surface and during deep well injection. He used the USGS geochemical modeling software PHREEQC to predict reactions under different mixing scenarios and at elevated temperature and pressure in a deep wastewater injection well. Dr Schroth's model interpretations will be used to identify water treatment methods to minimize injection well clogging by precipitated mineral phases.

Confidential Client, Lansing, Illinois, 2010
Dr. Schroth has used the USGS geochemical modeling software PHREEQC and PHAST to simulate the geochemical fate and transport of trace metals at a chemical processing site. The groundwater contains significant concentrations of organic waste chemicals and their breakdown products, and Dr. Schroth has utilized his research experience in mixed organic-metal waste to produce a more accurate simulation of metal transport in this regime. His work shows that metal mobility will be more limited than conservative models would predict, and when approved will allow the client to avoid costly and unnecessary remediation.

EPA Tar Creek Site, Northeastern Oklahoma, 2009-2011
Dr. Schroth was the lead geochemist for a large-scale lead/zinc mining site where EPA is proposing injection of fine to medium-grained tailings ("chat") into former mine workings. Dr. Schroth evaluated the geochemical data and used the geochemical modeling software PHREEQC and PHAST to simulate the reactions and transport of trace metals (cadmium, lead, zinc, and arsenic) in this environment. He combined hydraulic and geochemical skills to demonstrate that the injection of chat fines would have a temporary and minimal impact on the groundwater environment.

EPA Former Zinc Ore Processing Sites, Illinois, 2010-present
Dr. Schroth is currently the lead geochemist for three former zinc ore processing sites in which substantial amounts of process waste (slag) have been deposited as fill or in waste piles in the past. The slag has the potential to leach trace metals (cadmium, zinc, lead, nickel, arsenic) into the soil and groundwater, and Dr. Schroth is helping the team decide on well locations and constituents to be analyzed in the surface and groundwater samples. The goal of each project is to accurately assess the scale and impact of the problem and to produce innovative, cost-effective solutions for site cleanup.

Phosphate Mine Sites, eastern Idaho (EPA and USFS review), 2004-present
Dr. Schroth evaluated the fate and mobility of selenium in several phosphate mining sites in which natural selenium was mobilized by exposure to the atmosphere. He identified the key reactions that would enhance or limit mobility using geochemical analysis tools and modeling software. Dr. Schroth also reviewed the hydrogeologic analysis of the fractured bedrock aquifer and provided comments for EPA to help better evaluate the migration of selenium and other trace elements through this complex medium.

Confidential Client, Needles, CA, 2003-present
Dr. Schroth was the task manager for both geochemical evaluation and groundwater flow model development at this site where groundwater is contaminated with hexavalent chromium. He has determined the applicable geochemical and biogeochemical reactions at the site that limit chromium mobility in soil and groundwater and has presented geochemical analyses

numerous times to both technical and non-technical groups, including government agencies, tribal representatives, and consultants for a large municipal water district. Dr. Schroth wrote the background trace metals study for groundwater in the region, and was one of the main authors of the remedial investigation report, which included geochemical interpretation of site groundwater and surface water. He has employed the use of stable isotopes, ^{18}O and ^{2}H as well as ^{53}Cr, to further distinguish different water sources, chemical evolution, and mixing in the surface and subsurface. Dr. Schroth is also providing input to another consultant on the subject of potential migration of the *in situ* treatment byproducts manganese and arsenic, which are released from the soil under more chemically reducing conditions.

Rosevill Municipal Landfill, Roseville, CA, 2005-2011
Dr. Schroth is the senior technical reviewer for an ongoing monitoring program at a retired municipal landfill facility. In addition to interpreting data and reviewing reports, he is responsible for utilizing forensic geochemical techniques to identify potential sources of contaminants that are not believed to be associated with the facility. Dr. Schroth is currently reviewing data from offsite facilities and suggesting sampling and analysis methods that will better identify original sources of contamination.

EPA Lava Cap (Former Mine Site), Nevada City, CA, 2000-2007
Dr. Schroth provided geochemical analysis of groundwater and surface water data for this arsenic-contaminated site. A creek was inundated with mine tailings when a dam failed during a winter storm. The tailings were from a former gold mine and are rich in sulfide, iron, and arsenic. Dr. Schroth reviewed monitoring well, private well, and creek water analyses to assess the fate and mobility of arsenic in surface and groundwater. He has employed the use of stable isotopes, ^{18}O and ^{2}H, along with arsenic speciation data to determine that tailings likely have limited impact to groundwater outside of the area surrounding the creek.

West Basin Municipal Water District (WBMWD), Los Angeles County, CA, 2001
Dr. Schroth made use of natural tracers to estimate mixing and travel time of injected water from the West Coast Basin Barrier Project. Injection of imported and treated water is implemented parallel to the coast to prevent seawater intrusion from degrading water quality in municipal wells located further inland. WBMWD eventualy plans on injecting 100% treated water at the barrier, and Dr. Schroth's work helped to allieviate agency concerns regarding sufficient residence time of injected water. In addition, Dr. Schroth employed geochemical modeling to examine potential water quality effects that would come with switching to 100% treated water injection. Through this work, a revised monitoring plan is being developed with key monitoring points and analytes for verifying the model predictions.

Project Geochemist, City of Green Bay, Wisconsin, 2002
Dr. Schroth provided data analysis and geochemical modeling to address the unintended release of arsenic to groundwater during aquifer storage and recovery (ASR). He identified quantities of sulfide minerals present in the subsurface in larger quantities than anticipated by previous workers, and used his modeling skills to identify likely mechanisms for release and persistance of arsenic in groundwater. He is currently advising a Ph.D. study at the University of California at Berkeley that is using core samples from this study to identify more precisely

the key geochemical reactions that release and later control arsenic concentrations in groundwater.

Confidential Client, Richmond, CA, 1999-2002
Dr. Schroth was task manager in charge of data assessment and site conceptual model development for a former waste/stormwater retention facility. He combined historical boring logs, chemical data, and hydraulic information to create a holistic conceptual model. Dr. Schroth led a team to develop a finite element numeric model that brought complex hydraulic information together and accounted for subsurface drainage and saltwater intrusion along San Francisco Bay. The model was used to review site closure options and predict contaminant concentrations in an ecological receptor area.

Dr. Schroth was also the senior geochemist on this project. He identified groundwater zones of dissolved chlorinated solvent degradation and used this information to help delineate groundwater flowpaths. Dr. Schroth's geochemical analysis proved essential in showing that a site previously believed to be contaminated by chemical spills was in fact contaminated by rising groundwater carrying contaminants from another site.

Project Geochemist, Calleguas Municipal Water District, California, 2000
Dr. Schroth used geochemical modeling to assess the likelihood of chemical precipitation surrounding injection wells during aquifer storage and recovery (ASR). The success of ASR is largely dependent on avoiding clogging during injection from processes such as precipitation, biofouling, and clay destabilization. Dr. Schroth evaluated these factors in his evaluation.

Project Geochemist, INEEL CERCLA Disposal Facility, Idaho, 2001
Dr. Schroth predicted leachate concentrations of radionuclides in a proposed low-level waste landfill using geochemical modeling. The landfill was modeled for potential leachate impacts on deep groundwater. He selected key mineral phases of rare-earth elements for model input, and also evaluated mobility of both inorganic and organic compounds for vertical transport modeling.

Academic Experience

Assistant Professor, San Francisco State University, California (1997 – 2000)
Responsible for teaching majors courses in Hydrogeology and Groundwater Contamination at the undergraduate and graduate levels. Built a laboratory for use in hydrogeochemical research and established an agreement with local agencies to provide internship and access for the first graduate hydrogeology student at the university, whose thesis work involved basin boundary definitions and hydrologic budget for San Francisco and the Northern San Francisco Peninsula. Mentored several students to produce undergraduate thesis projects in hydrogeology and geochemistry. Taught other graduate courses in research methods and quantitative methods in Applied Geosciences. Also taught general education courses, including Environmental Geology and The Violent Earth, and computer applications for geologists.

Publications

Schroth, B.K. and G. Sposito. 1998. Effect of Landfill Leachate Organic Acids on Trace Metal Adsorption by Kaolinite, *Environmental Science & Technology* **32**: 1404-1408.

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