

Special Meeting of the
BOARD OF TRUSTEES
SANTA YNEZ RIVER WATER CONSERVATION DISTRICT,
IMPROVEMENT DISTRICT NO. 1
will be held at **6:00 P.M. PST, THURSDAY, MAY 23, 2019**
at 1070 Faraday Street, Santa Ynez, CA – Conference Room
Teleconference Location: Pono Kai Resort – 4-1250 Kuhio Hwy, Kapaa, HI 96746

AGENDA

- I. CALL TO ORDER AND ROLL CALL**
- II. PLEDGE OF ALLEGIANCE**
- III. REPORT BY THE SECRETARY TO THE BOARD REGARDING COMPLIANCE WITH THE REQUIREMENTS FOR POSTING OF THE AGENDA**
- IV. ADDITIONS OR CORRECTIONS, IF ANY, TO THE AGENDA**
- V. PUBLIC COMMENT** - Any member of the public may address the Board relating to any non-agenda matter within the District’s jurisdiction. The total time for all public participation shall not exceed fifteen (15) minutes and the time allotted for each individual shall not exceed three (3) minutes. The District is not responsible for the content or accuracy of statements made by members of the public. No Action will be taken by the Board on any public comment item.
- VI. BOARD OF TRUSTEES – DIVISION 3 VACANCY**
 - a) Consider candidates for the position of Trustee for Division 3 of the District
 - b) Consider recommendation, if any, to the Santa Ynez River Water Conservation District, regarding the position of Trustee for Division 3 of the District
- VII. ADJOURNMENT**

This Agenda was posted at 3622 Sagunto Street, Santa Ynez, California and notice was delivered in accordance with Government Code Section 54954. This Agenda contains a brief general description of each item to be considered. The Board reserves the right to change the order in which items are heard. Copies of the staff reports or other written documentation relating to each item of business on the Agenda are on file with the District and available for public inspection during normal business hours. A person who has a question concerning any of the agenda items may call the District’s General Manager at (805) 688-6015. Written materials relating to an item on this Agenda that are distributed to the Board of Trustees within 72 hours (for Regular meetings) or 24 hours (for Special meetings) before it is to consider the item at its regularly or special scheduled meeting(s) will be made available for public inspection at 3622 Sagunto Street, during normal business hours. Such written materials will also be made available on the District's website, subject to staff’s ability to post the documents before the regularly scheduled meeting. If you challenge any of the Board’s decisions related to the agenda items above in court, you may be limited to raising only those issues you or someone else raised at the public meeting described in this notice or in written correspondence to the Board prior to the public meeting. In compliance with the Americans with Disabilities Act, if you need special assistance to review agenda materials or participate in this meeting, please contact the District Secretary at (805) 688-6015. Notification 72 hours prior to the meeting will enable the District to make reasonable arrangements to ensure accessibility to this meeting.

APPLICATION FOR APPOINTMENT

**Board of Trustees of the Santa Ynez River Water Conservation District,
Improvement District No.1**

If you are interested in serving on the Board of Trustees of Santa Ynez River Water Conservation District, Improvement District No.1, please complete this application form and return it to: Santa Ynez River Water Conservation District, Improvement District No.1, Attention Mary Martone, Secretary to the Board of Trustees, by mail at P.O. Box 157, Santa Ynez, CA 93460, or by hand delivery to 3622 Sagunto Street, Santa Ynez. Applications must be received on or before 5:00 p.m. on Monday, May 13, 2019.

Name: Lori Parker
 Residence Address: 805 Marcelino Dr., Solvang, CA 93463
 Business or Mailing Address: same
 Phone: (Home): _____ (Office): _____ (Cell) 530-277-3032
 E-Mail: beatdog100@yahoo.com

EDUCATION			
Institution	Major	Degree	Year
Cal Poly SLO	Social Sciences	BS	1987

(Please use additional page if more space is needed)

WORK / VOLUNTEER EXPERIENCE				
Organization	City	Position	From	To
NCL Board	SYV	secretary	2013	2015
SYV Pony Club board	SYV	"	2012	2014
Winnipeg self	varied	Writer	2010	Present

(Please use additional page if more space is needed)

Statement of Qualifications: (Please briefly describe your qualifications and why you are interested in serving on the ID No.1 Board of Trustees. Please use additional page if more space is needed.)

Qualifications: I am familiar with serving on (non-profit) boards and I am a positive, level-headed person that works well on a team. I am interested in the issues that affect the groundwater and reservoirs that serve our valley. I am passionate about protecting

Are You a Registered Voter in Division 3 of ID No.1: Yes No

Are You a Holder of Title to Land in Division 3 of ID No.1: Yes No

Please Attach Separate Page Identifying a Minimum of Three (3) Professional or Personal References, Including Affiliations, Periods Known, and Daytime Telephone Numbers

APR 29 2019

RECEIVED

Statement, contd :

the amount, health and well-being of our County's water supply. I enjoy serving our community.

Professional / Personal References :

- ① Jennifer Johnson 805-479-5202
Santa Ynez Valley Pony Club
National Charity League
2011 - present
- ② Brett Jones 805-886-2706
Friend
2000 - Present
- ③ Debbi Knight 210-693-9402
Atterdag Village Marketing Director
(Debbi occasionally hires me to write online and brochure marketing materials)
2015 - Present

S.Y.R.W.C.D.ID.#1

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Name: Stephen (Steve) J. Cullen
 Residence Address: 805 Carriage Drive, Solvang, CA 93463
 Business or Mailing Address: Same
 Phone: (Home): (805) 688-0489 (Office): (805) 681-2985 (Cell) (805) 886-8770
 E-Mail: s.j.cullen@outlook.com

EDUCATION			
Institution	Major	Degree	Year
U.C. Davis	Soil Science and Hydrology	B.Sc.	1977
Montana State University	Soil Physics	M.Sc.	1981
U.C. Santa Barbara	Geography (Hydrogeology)	Ph.D.	1996

(Please use additional page if more space is needed)

WORK / VOLUNTEER EXPERIENCE				
Organization	City	Position	From	To
See attached resume for complete work experience, registrations, and qualifications				

(Please use additional page if more space is needed)

Statement of Qualifications: (Please briefly describe your qualifications and why you are interested in serving on the ID No.1 Board of Trustees. Please use additional page if more space is needed.)

Additional page(s) attached

Are You a Registered Voter in Division 3 of ID No.1: Yes No

Are You a Holder of Title to Land in Division 3 of ID No.1: Yes No

S.Y.R.W.C.D. ID.#1
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Please Attach Separate Page Identifying a Minimum of Three (3) Professional or Personal References, Including Affiliations, Periods Known, and Daytime Telephone Numbers

Stephen (Steve) J. Cullen - Professional Experience

- American Groundwater Trust, 50 Pleasant Street, Suite 2, Concord, NH 03301, October 2018 to present
Member, Board of Directors
- Daniel B. Stephens & Associates, Inc., Santa Barbara Co., California, September 2004 to present
Hydrogeologist, Senior Vice President, Director of California Operations
Principal Stock Holder, 2004-2015
Sold Stock interest to Geo-Logic Associates, December, 2015
- MWH Americas, Inc., Santa Barbara Co., California
Principal Hydrogeologist, Vice President, Domestic Energy & Infrastructure, June 2002 - September 2004
Director, National Experts Group, June 2002 to September 2004
- IT /Shaw Group, Santa Barbara, California, May 2000 to August 2002
Principal Hydrogeologist, Vice President, Environment and Infrastructure
- Arcadis Geraghty & Miller, Inc., Santa Barbara, California
Principal Hydrogeologist, Associate Vice President, February 1998 to May 2000
Principal Hydrogeologist, Area Operations Manager, June 1997 to February 1998
Principal Scientist, Office Manager, November 1992 to February 1998
- University of California, Santa Barbara, Vadose Zone Monitoring and Research Laboratory, Institute for
Crustal Studies, Faculty
Associate Research Hydrologist, August 1995 to 1996
Assistant Research Hydrologist, August 1989 to 1995
- Metcalf & Eddy, Santa Barbara, California, November 1990 to November 1992
Senior Environmental Scientist
- Kaman Sciences Corporation, Santa Barbara, California, August 1989 to November 1990
Senior Environmental Scientist
- Soilmoisture Equipment Corp., Santa Barbara, California, June 1985 to August 1989
Director of Technical Marketing and Product Development
- Private Environmental Consultant, Santa Rosa, California, June 1984 to August 1985
- Steffen Robertson Kirsten, Lake County, California, March to June 1984
Geotechnical Laboratory Support, Heap Leach Mining
- Centrol, Inc., Webster, South Dakota, September 1981 to February 1984
Lead Soil Scientist, Consultant, and Operations Manager
- Montana State Cooperative Extension, Fairfield, Montana, May to August 1981
Extension Specialist, Irrigation Management and Nitrate Groundwater Pollution
- Montana State University, Bozeman, Montana, September 1979 to April 1981
Faculty, Assistant Research Soil Scientist
- United States Forest Service, Tongass National Forest, Sitka, Alaska, January 1978 to September 1979
Forest Soil Scientist
- United States Bureau of Land Management, Salem, Oregon, July to September, 1977
Soil Scientist
- United States Forest Service, Klamath National Forest, Seiad Valley, California, June to August, 1976
Soil, Geologic, Hydrologic, and Timber Survey Intern

Professional References

Arthur Chianello, PE
Water Resources Manager
City of Bakersfield
1000 Buena Vista Road
Bakersfield, CA 93311
661-326-3715
achianel@bakersfieldcity.us

I have known and worked on various consulting project with Mr. Chianello since 2012

Nicole Terese Sweetland, PhD, PG
Chief Executive Officer, Daniel B. Stephens & Associates
President, Geo-Logic Associates, Inc
3916 State Street, Suite 1A
Santa Barbara, CA 93105
805-681-2984
nsweetland@dbstephens.com

I have known and worked closely with Dr. Sweetland since 2004

Andrew Stone
Executive Director
American Groundwater Trust
50 Pleasant Street
Concord, New Hampshire 03301
(603) 228-5444
astone@agwt.org

I have known Mr. Stone since approximately 2009, I have worked with him on the AGWT's BOD since 2017

Stephen J. Cullen, Ph.D., P.G.

Principal Hydrogeologist, Senior Vice President, California Operations



EDUCATION

Ph.D., University of California at Santa Barbara, 1996

Dissertation title: Field and Laboratory Investigations of Contaminant Natural Attenuation and Intrinsic Remediation in Soils and the Vadose Zone

M.Sc., Soil Physics, Montana State University, 1981

B.Sc., Soil Science and Hydrology, University of California at Davis, 1977

PROFESSIONAL REGISTRATIONS

California Professional Geologist, No. 7399

Certified Environmental Manager, State of Nevada, No. 1839

Certified Professional Soil Scientist, Reg. No. 03169, Soil Science Society of America

Dr. Cullen is a Principal Hydrogeologist with more than 40 years of experience. Areas of expertise and experience include vadose zone hydrogeology, recharge assessments, vadose zone and groundwater flow and transport modeling, landfill investigations and monitoring systems, land disposal of biosolids and sewage effluent, land treatment facilities, environmental contaminant site investigations, intrinsic bioremediation as well as active approaches to soil and groundwater remediation. He has provided expert opinion reports and testimony in state and federal court, and before the California State Water Resources Control Board regarding the resolution of a wide range of groundwater and vadose zone characterization, monitoring, and remediation problems. Dr. Cullen serves on the American Ground Water Trust Board of Directors.

Groundwater, Surface Water, Vadose Zone, & Natural Resource Investigations

Updated Water Master Plan, Big Bear City Community Services District, Big Bear, California

As principal hydrogeologist, conducted a study to determine long-term groundwater recharge potential to the Big Bear Valley watershed. Directed construction of watershed-scale recharge model using the Distributed Parameters Water Model (DPWM). Evaluated prior efforts by U.S. Geological Survey and private consultants, updated the watershed conceptual model, including identification of previously unrecognized basin discharge features. Coordinated efforts of civil engineering and hydraulic modeling team partners to developed a master plan that addressed current supply, current hydraulic conveyance systems and infrastructure, land use and water demand, system analysis, and recommended capital improvements.

Groundwater Sustainability Plan, Owen Valley Groundwater Sustainability Agency, Bishop, California

Principal hydrogeologist and technical reviewer of team responsible for preparation of Groundwater Sustainability Plan to comply with and meet the requirements of California's Sustainable Groundwater Management Act (SGMA). In progress.

Groundwater Sustainability Plan, Fillmore-Piru Groundwater Sustainability Agency, Bishop, California

Principal hydrogeologist and technical reviewer of team responsible for preparation of Groundwater Sustainability Plan to comply with and meet the requirements of SGMA. In progress.



Nitrate/Phosphorus Watershed and Lake Assessment and Remedial Planning, Lake San Marcos, San Diego County, California

Principal and Reviewing Hydrogeologist for remedial investigation/feasibility study (RI/FS) completed to evaluate nitrate and phosphorus loading to watershed and lake. Oversaw project team during fast-tracked RI/FS development and agency review, interaction, and approval. Project is currently moving into nitrate/phosphorus remedy pilot testing for nutrient abatement.

Hydrologic Analysis, Kern River Environmental Impact Report, City of Bakersfield, California

Principal hydrogeologist and technical reviewer responsible for oversight of the quantitative evaluation of groundwater impacts that will result from planned increased Kern River flows through the City of Bakersfield. The 118-year historical record of upstream and stream-reach Kern River flow was used as the basis for the initial design and development of a water resource database and to conduct water balance modeling in order to project stream channel losses due to evapotranspiration and infiltration, and to evaluate how far downstream flows of various planned magnitudes will reach. Subsequently, a comprehensive groundwater database was designed and developed incorporating historical groundwater elevation and water quality data from hundreds of wells. Data was acquired from the City and numerous adjacent water purveyors. Using the constructed databases, a telescoped, customized version of the U.S. Geological Survey Central Valley numerical groundwater flow model was used to quantify long-term aquifer overdraft, impacts of river losses to groundwater levels, gradients, flow to municipal well fields, and the impacts of alternative groundwater pumping scenarios. A plan is currently being developed to augment the database with data from additional wells, piezometers, and recharge facilities. The database will be used for ongoing monitoring of aquifer conditions, efficacy of recharge, and the impacts of groundwater extraction.

Sustainable Safe Yield Study, Santa Paula Groundwater Subbasin, United Water Conservation District, Santa Clara River Watershed, Ventura County, California

Principal Hydrogeologist, Technical Reviewer. Updated the safe yield of the Basin. Developed detailed water balance calculations based on inflows, outflows, and changes in basin groundwater storage; groundwater storage evaluated using statistical analysis of available hydrographs. Recharge assessment addressed by use of an advanced watershed model, the Distributed Parameter Watershed Model (DPWM), to account, in part, for surface water/groundwater interaction. Assessed surface water/groundwater interactions through comparison of installed groundwater piezometer and well data to nearby stream gauging data. Evaluated impact of groundwater seeps on Santa Paula Creek flow.

Strategic Long-term Groundwater Management Plan, Owens Valley, Los Angeles Department of Water and Power, Los Angeles, California

As principal hydrogeologist, conducted a study of a technical groundwater management guidance protocol for the management of Owens Valley groundwater resources. Performed detailed analysis of hydrologic instrumentation used in Owens Valley, conducted mathematical analysis of the algorithms used to make groundwater pumping decisions, and evaluated the scenarios that would result from following the management protocols. Evaluated the state-of-the-art methodologies for measuring and estimating evapotranspiration. Proposed approach to the strategic management of groundwater in the Owens Valley subsequently recommended for adaptation.



Development of Groundwater Budgets for Groundwater Sustainability Planning, Fox Canyon Groundwater Management Agency, Ventura County, California

Principal-in-charge responsible for preparation of the historical groundwater budgets for the Agency's Groundwater Sustainability Plan (GSP) that is required by California's Sustainable Groundwater Management Act (SGMA). GSPs are required for the four groundwater basins within the Agency's jurisdiction - Las Posas, Arroyo Santa Rosa Valley, Pleasant Valley, and Oxnard - and must include measurable goals and objectives, and implementation actions to achieve and maintain basin sustainability. DBS&A prepared the historical groundwater budgets for each basin, and implemented a distributed parameter watershed model (DPWM) to address hydrologic data limitations by estimating key components of the groundwater/surface water balance. Development of the groundwater budgets is a critical step in the development of the Agency's GSP and required to achieve compliance with SGMA.

Integrated Surface-Water Groundwater Model Development, Ventura River Watershed, California State Water Resources Control Board

Principal in Charge, technical oversight, review, and signatory. Multi-year project to develop a GSFLOW-based integrated surface water/groundwater/chemical transport model of the Ventura River watershed for evaluation of management options to optimize instream flows and reduce nutrient impacts associated with a TMDL regulation. To-date: oversaw completion of detailed geologic conceptual model for the watershed, including multiple detailed cross sections of alluvium and underlying bedrock aquifer materials; model domain design; hydrogeologic data compilation and parameter estimates.

Numerical Groundwater Flow Model Design, Ojai Groundwater Basin, Ojai Basin Groundwater Management Agency, Ojai, California

Principal hydrogeologist providing technical review and quality assurance on design and development of a basin-scale groundwater database and numerical model using MODFLOW-SURFACT. Assisted agency in collecting local farm, ranch, and utility groundwater elevation and pumpage data for use in the model development and calibration. Model calibration included transient effects of recharge, groundwater pumpage, and surface water-groundwater interactions. A distributed parameter watershed model (DPWM) was applied to parameterize the groundwater recharge to the groundwater flow model. Model is used by the agency, on an ongoing basis, for groundwater management planning and to understand impacts of various climate and groundwater withdrawal scenarios, including long-term drought, on groundwater levels throughout the basin. DBS&A updates the groundwater elevation database and numerical model calibration on an ongoing basis when requested by the agency.

San Antonio Creek Spreading Grounds, Ventura County Watershed Protection District, Ventura, California

Principal hydrogeologist responsible for the assessment of hydrology, geology, and the designed diversion works; intake pipelines; and water conveyance for the project as consultant to Ventura County Watershed Protection District (VCWPD). DBS&A completed a 100-percent design for diverting a portion of the precipitation that is typically lost downstream to rehabilitated spreading grounds and aquifer recharge wells. Project resulted in greater groundwater storage and production from local water supply wells and less reliance on already limited surface water supplies. Installed depth-discrete



monitoring well near the spreading grounds to monitor the effectiveness project and help to develop a better hydrogeologic understanding of the Ojai Valley Groundwater Basin. Numerically modeled future groundwater elevation trends.

Groundwater-Surface Water Interactions, Santa Maria River, California

Principal hydrogeologist and technical reviewer responsible for oversight of the evaluation of the effect of surface water flows on local groundwater elevations, and groundwater pumping effects on local surface water flows in an alluvial groundwater basin. Surface water flows occur from both storm runoff, and from controlled releases from Twitchell Reservoir. Reservoir releases are currently conducted to recharge the groundwater system, and the State of California is evaluating the possibility of altering release rates and timing to maintain additional surface water flows for enhancement of endangered species habitat.

Groundwater Budget and Approach to a Groundwater Management Plan Upper and Lower Ventura River Basin, Ventura County Watershed Protection District, Ventura, California

Provided technical review, oversight, and quality assurance for a groundwater budget for the Ventura River watershed groundwater subbasins and an approach to a groundwater management plan (GWMP). Primary inputs to groundwater in the Upper subbasin are infiltration and surface water recharge from Lake Casitas and the Ventura River; primary outputs are municipal and agricultural extractions. Primary inputs to the Lower subbasin are infiltration and inflow from the Upper Subbasin; primary outputs are discharge to surface water and the Pacific Ocean. The GWMP addressed public participation, interagency involvement, coordination with the Ventura River Watershed Council, literature review and technical analysis, establishment of management objectives, and development of a monitoring program.

Watershed Management and Hydrologic Monitoring, Pepperdine University, Southern California

As principal hydrogeologist for more than 10 years, provided oversight for hydrologic monitoring program and water balance modeling effort to document and ensure institutional water use sustainability and that irrigation of reclaimed wastewater does not result in downslope geotechnical instability. Tasks included design, development and maintenance of a long-term institutional water database and water balance model; monthly monitoring of irrigation using recycled water, precipitation, evapotranspiration, surface runoff, soil storage, and deep percolation; monitoring of perched and regional groundwater elevations; water quality sampling and reporting; support National Pollutant Discharge Elimination System (NPDES) permit requirements; semiannual and annual reporting to regulatory agencies and community groups; general hydrologic advice regarding recycled water demand, water conservation, water quality enhancement, and operational efficiency measures aimed at optimizing institutional resources.

Rose Valley Groundwater Model, Inyo County Water Department, Independence, California

Provided technical review and quality assurance as principal on revised and updated existing groundwater flow model of Rose Valley, California, immediately south of Owens Valley. A distributed parameter watershed model (DPWM) was applied to parameterize the groundwater recharge to the groundwater flow model. The flow model was updated with respect to site geologic observations and data and calibrated to historical transient conditions dating back to 1915. The updated model was used



to reevaluate future allowable pumping amounts that would avoid aquifer overdraft and downgradient negative impacts to Little Lake.

Design and Development of Well No. 48 - Water of Life Church Well, Rancho Cucamonga, Cucamonga Valley Water District, California

Principal-in-Charge for inspection and design services for the drilling, construction, development, and testing of the well. The team reviewed construction plans and specifications, and provided comments and recommendation, provided supervision of drilling, prepared a lithologic log of drill cuttings, and oversaw geophysical logging. Target zones were identified for aquifer isolation zone tests and a recommended analytical suite. The team provided oversight of isolated zone sampling for three zones and oversight of well construction, development, and pump testing. The final well design was based on analysis of pilot-hole lithology, particle size analyses, and geophysical logging results. The final well completion report included an analysis of the high water quality sampled from the well (TDS approximately 200 mg/L), the production capacity test results for the well (3,500 gpm), and recommendations for a suitable pump to produce plentiful, high quality water.

Olcese #2 Well Remediation and Repair, City of Bakersfield, California

Principal-in-charge for evaluation of a defective agricultural well (Olcese well #2) and recommendations as to the well's potential for rehabilitation or whether it should be replaced. Review of a downhole video and the original driller's report revealed several major issues contributing to the wells poor performance, including: casing and screen mineral encrustation, damage to the casing resulting from subsidence, and debris and more than 30 feet of sediment in the bottom of the well. Rehabilitation measures were recommended and subsequently implemented to clean and repair the well. Well rehab was accomplished at a small fraction of the cost of well replacement.

Evaluation of Yield and Siting Feasibility Study for Managed Aquifer Recharge, Bighorn Desert View Water Agency, Johnson Valley, California

Principal-in-charge for project to implement and manage an exploration drilling program used to evaluate the subsurface hydrogeology for possible Managed Aquifer Recover (MAR) projects. The team provided site, construction, and project management, including coordinating the arrival of all subcontractors, providing descriptive logs of the drill cuttings, interpreting subsurface hydrogeology, recommending test well design and well development/testing methods, and documenting site and construction activities in a final well construction report. The test well was developed using a combination of methods, including bailing, swabbing, and air-lifting. The team recommended a comprehensive exploration drilling program and installation of small-diameter test wells to expand understanding of the hydrogeology of the groundwater basin.

Groundwater Supply Evaluation, Confidential Private Ranch, Santa Barbara County, California

Principal hydrogeologist and technical reviewer responsible for evaluating existing and potential surplus water supplies to ranch property. Evaluation included detailed local bedrock stratigraphy, local faults mapped by others, discovery of two new faults which effectively bind the bedrock aquifers into an elevated groundwater basin isolated from other areas and users. Two new wells were designed and constructed to extract groundwater from previously untapped aquifers. Estimated annual average aquifer recharge using the water-balanced-based distributed parameter watershed model (DPWM).



Evaluation of Numerical Model Estimates of Aquifer Recharge, Indio Water Authority, Indio, California

Principal hydrogeologist and technical reviewer responsible for oversight for a review of the Coachella Valley Groundwater Model, a MODFLOW model that has been used for groundwater management planning and estimates of groundwater recharge from several water spreading pond facilities. Provided Indio Water Authority with independent evaluation of model assumptions and implementation, and resulting limitations of conclusions regarding groundwater recharge assessments.

Recomputation of Ambient Water Quality, Basin Monitoring Program Task Force, Santa Ana Watershed Project Authority, Santa Ana River Watershed, California

Providing senior oversight as part of a team working to recompute the ambient water quality (AWQ) for total dissolved solids (TDS) and nitrate for the Santa Ana Watershed groundwater management zones for the period 1996 to 2015. AWQ recomputation required by the Santa Ana Regional Water Quality Control Board (RWQCB) Basin Plan as part of the basin monitoring program. Ambient nitrate and TDS determinations in Santa Ana River Watershed groundwater management zones are compared to water quality objectives and used by the RWQCB to assess assimilative capacity. DBS&A contours water level and water quality data for over a dozen management zones, and summarizes the data from each management zone by creating raster grids of the contoured water level and water quality used to calculate the water quality objectives.

Evaluation of Salt and Nutrient Loading, Hollandia Produce LLC, Ventura County, California

Principal hydrogeologist and technical reviewer responsible for oversight for evaluating the quantitative evaluation of potential salt and nutrient impacts to groundwater. Proposed facility would use local groundwater and harvested rain water to meet process water needs and apply spent process water to a rain garden and other on-site landscaping. Salt and nutrient loading methodology based on published U.S. Environmental Protection Agency two-dimensional mixing-model approach. An executable spreadsheet model was developed in support of a successful conditional use permit application.

Evaluation of Salt and Nutrient Loading by Application of Agricultural Process Water, Dreisbach Farming, Moss Landing, California

Principal hydrogeologist and technical reviewer responsible for oversight for evaluating process water effluent disposed on land based on analysis of water quality transformations and fate from effluent stage, in vadose zone pore liquids, and in groundwater. Monitored and interpreted strawberry processing plant effluent data at various stages along the application and migration pathway. Reported to and interacted with Regional Water Quality Control Board.

Evaluation of Pesticide Movement in Rangeland and Farmland Soils, Farm Plaintiff Group, Primary Federal Trial, Southeastern Idaho

Principal hydrogeologist for the evaluation of the subsurface environmental fate of Sulfometuron Methyl (SM) on farmland subsurface after aerial application across Southeastern Idaho rangeland. The SM was transported to farmlands after weed-abatement application on rangelands. Conducted vadose zone flow and transport modeling using Hydrus-1D (modified to include a wind-erosion subroutine and



a farm tillage subroutine) to simulate the movement of water and SM in the rangeland and farmland subsurface. Plaintiff group achieved favorable case settlement.

Quantification of Nitrogen Removal, Eastern Municipal Water District, Perris, California

As principal hydrogeologist, performed subsurface evaluation associated with recycled water storage ponds. Project involved data collection and review, conceptual modeling, pond recharge flow pathway analysis, pressure/vacuum lysimeter and monitoring well installation, sampling, analysis and reporting. Data evaluation demonstrated total inorganic nitrogen (TIN) removal from recycled water during recharge on the order of three times the default reduction values assumed in Regional Water Quality Control Board (RWQCB) models. Project work included lysimeter design, drilling and installation oversight; weekly and monthly monitoring and sample collection; data evaluation using comparison of boron to chloride ratios; stiff water quality diagrams comparisons to native water; QC sampling; presentations of project findings to stakeholders from the RWQCB, Technical Oversight Committee, and Eastern Municipal Water District Board and Staff personnel.

Investigation of Aquifer Connectivity and Sources of High Level Total Dissolved Solids Impacts to Deep Groundwater, Basic Management, Inc., Henderson, Nevada

As principal hydrogeologist, evaluated source of high concentrations of total dissolved solids (Total Dissolved Solids (TDS); >100,000 ppm) using analysis of bomb tritium and oxygen and hydrogen stable isotopes to demonstrate that deep TDS was not anthropogenic but rather the result of deep groundwater dissolving paleo-evaporitic deposits in the Tertiary Muddy Creek formation. Aquifer connectivity was evaluated using historic plant operational history, evaluation of Site hydrostratigraphy, lithology and mineralogy, geochemical analysis and comparison of aquifer waters, industrial chemical tracers, analysis of aquifer vertical gradients, and analytic groundwater flow calculations.

Portuguese Bend Landslide Mitigation Feasibility Study, City of Rancho Palos Verdes, Los Angeles County, California

Principal-in-charge leading a geologic and engineering team to develop an updated feasibility study (FS) that will be used to identify a solution to stabilize the Portuguese Bend Landslide Complex (PBLC). Extensive damage due to PBLC issues resulted in over \$45 Million in City maintenance costs, permanent damage to private property, and significant and ongoing risks to human health and safety. As conceived, the solution approach will capture and control regional storm water, extract groundwater from the PBLC, and stabilize city utility infrastructure in the PBLC vicinity. A significant engineering challenge to the project is that wells or structures constructed as part of the solution are at short-term risk of destruction by the continuing movement of the PBLC. The FS will also be used seek and acquire federal infrastructure funding to assist in implementing the solution.

Investigation of Pesticide Movement in Rangeland Soils, Farm Plaintiff Group, Bellwether Trial, Southeastern Idaho

Principal hydrogeologist for evaluation of the subsurface environmental fate of Sulfometuron Methyl (SM) after aerial application across Southeastern Idaho rangeland. Conducted vadose zone flow and transport modeling using Hydrus-1D to simulate the movement of water and contaminant in the rangeland subsurface. Evaluated effect of soil-forming processes and their effect, at the micro and



macro scales, on SM concentration distributions. Evaluated the effects of farm tillage and irrigation on SM leaching. Authored expert reports and provided expert opinion in federal district court deposition and trial testimony. Plaintiff-favorable verdict rendered at jury trial.

Stormwater Detention-Groundwater Recharge Project Development, Sonoma County Water Agency, Sonoma County, California

Principal hydrogeologist conducting stormwater management and groundwater recharge studies in the Sonoma Valley watershed under contract to the Sonoma County Water Agency. DBS&A conducted field investigations with the objective to characterize hydrogeologic properties related to soil water movement through the unsaturated zone, and facilitate development of a project for wetland and grassland enhancement, stormwater capture, and enhanced groundwater recharge. DBS&A has also played a key role in stakeholder meetings that have included the Basin Advisory Panel (BAP) and the Technical Advisory Committee (TAC).

Active Conjunctive Use for Water Resources Management, Confidential Client, Southern California

Principal hydrogeologist responsible for design to recharge and store water from local wastewater treatment plant and diverted stormwater during winter months when irrigation demand is low, and withdraw water during the summer when demand is high. Feasibility study now underway.

Recharge Project to Enhance Conjunctive Use Options, Duane Morris, San Francisco, California

Principal hydrogeologist and testifying expert responsible for the preparation of expert opinion report on a southern San Joaquin groundwater basin that evaluated historic overdraft conditions, quantified the loss of groundwater storage, projected future groundwater elevation declines and storage losses under current conditions, identified loss of well field efficiency and concomitant rise in energy costs, identified well field production losses, evaluated and identified decline in water quality under overdraft conditions, quantified the recharge capacity of geologic framework, and identified the source and logistics of providing recharge source water. Provided deposition and trial expert testimony.

Vadose Zone Monitoring System, PG&E, Hinkley, California: Re-Design, Installation, and Testing Oversight

Principal hydrogeologist responsible for technical review of engineering specifications and drawing for vadose zone monitoring system retrofit consisting of pore-liquid samplers at PG&E's Hinkley Compressor Station. Determined that originally designed system was fatally flawed and provided system redesign. The redesigned system also had to address the challenge of a retrofit lysimeter installation in a 22° jack-and-bore slant borehole. Dr. Cullen provided the design details and procurement specifications. He also directed DBS&A's oversight of construction and initial testing of vadose zone monitoring program, including installation activities for four vadose zone monitoring stations into lateral boreholes, testing of all pressure/vacuum lysimeters and installation of companion soil moisture frequency domain sensor and dataloggers. Oversaw DBS&A's training of field staff on the lysimeter testing procedures before and after installation.



Hydrologic Characterization and Groundwater-Surface Water Budget for Big Canyon Watershed, City of Newport Beach, California

Principal hydrogeologist and technical reviewer responsible for oversight of hydrogeologic characterization, recharge and infiltration modeling, groundwater flow mapping, selenium flux assessment, and water balance development. The goal is to ultimately control selenium and nitrogen flux and meet Total Maximum Daily Load requirements. Of unique interest is the role that the ubiquitous Monterey formation plays in contributing to the naturally high background levels of selenium originating from native geologic sources.

Hydrologic Characterization and Groundwater-Surface Water Budget for Newport Bay Watershed, Orange County, California

Principal hydrogeologist and technical reviewer responsible for oversight for a water budget being developed to support mitigation of high concentrations of nitrogen and selenium in the shallow groundwater in the historic Swamp of Frogs area. Groundwater discharges are a major contributor to chemical impacts in the Newport Bay watershed.

Well No. 9 Locating and Design, City of Signal Hill, California

Principal-in-charge for project to provide the city with a groundwater source within city limits and south of bridges that separates other water sources. In addition to typical well installation field testing procedures, feasibility studies, preliminary designs, and permit applications for a new water supply well for the city at a city-selected site were conducted. Specific challenges for the project included oil well proximity, aquifer material facies changes near the elevated Signal Hill, faulting in the project vicinity, and colored groundwater. The water supply well was successfully constructed in an acceptable location and yielded good quality water (TDS approximately 300 mg/L) at a sustained pumping rate of 1852 gpm and a specific capacity of 41.06 gpm/ft ddn.

New Municipal Supply Well Construction Hydrogeologic Support, City of La Verne, California

Principal-in-charge for the Beech Street well construction project that provided the City with additional groundwater production capabilities for municipal use. Team provided technical specifications, recommendations for final well design, pumping specification and placement and compliment with NPDES permitting. Water quality constraints, primarily due to high nitrate concentrations, limited the ability of the City to fully develop the groundwater resource. Well installation involved pilot hole drilling, zone testing, geophysical logging, and full-time supervision of casing installation, test pumping, and development. The final well design was recommended after completion of aquifer zone isolation testing, geologic logging, and downhole geophysical surveying.

Environmental Impact Report Support: Evaluation of Redevelopment on Groundwater Quantity, Flow, and Quality, Pepperdine University, California

Principal hydrogeologist and technical reviewer responsible for evaluating potential impacts that the college campus development improvement project could have on groundwater beneath the campus and downgradient properties. A water balance model was used to estimate potential impacts to groundwater resulting from the planned development construction. The evaluation provided an assessment of the campus geology and considered the potential impacts to groundwater recharge,



levels, flow direction, and quality due to changes in topography, pervious surface area, irrigation, and sub-drainage.

RiverPark Recharge Basins Hydrogeologic Feasibility Study, United Water Conservation District, Santa Paula, California

Principal hydrogeologist performing hydrogeologic analysis of potential spreading of Santa Clara River water via recharge basins. Scope includes: literature research regarding projects with similar site attributes; regulatory research to determine potential regulatory hydraulic and water quality constraints; compilation, review, and analysis of site and basin historical data, analytic modeling; impact assessment of spreading water; evaluation of monitoring approaches; recommendations for future work.

Evaluation of Long-term Recharge Rates, Edwards Air Force Base, California

Principal hydrogeologist for quantitative study of long-term recharge rates in the Mojave Desert using chloride balance method, bomb tritium, chlorofluorocarbons (CFCs) profile analysis, unsaturated flux calculation. Results submitted to Army Corp of Engineers; presentation to California Groundwater Association. Results were used to assess the treatability of vadose zone perchlorate.

Assessment of Impact of Real Estate Development on Groundwater Recharge, Confidential Client, Southern California

Principal hydrogeologist for assessment of the impact of college campus expansion on local groundwater recharge and water balance. Scope includes evaluation of site geologic framework, assessment of factors affecting future water balance, predictive quantitative water-balance modeling, assessment of resulting impacts, and development of post-construction monitoring plan.

Development of Regional Hydrogeologic Flow Model, Multi-party Methyl Tertiary-Butyl Ether Litigation, Suffolk County, Long Island New York

Technical specialist for the methyl tertiary-butyl ether (MBTE) evaluation of historical research and studies to develop a consolidated hydrogeologic flow model of Suffolk County. Identified primary aquifers, water production potential, vertical gradients, relative groundwater flow velocities, and natural and anthropogenic sources of recharge.

Methyl Tertiary-Butyl Ether Litigation, Confidential Client, Long Island, New York

Technical specialist for the evaluation of methyl tertiary-butyl ether (MBTE) investigation techniques and data derived for: 1) reasonableness of cost, and 2) contribution toward the selection and implementation of a remedial alternative. Issues addressed included: direct push drilling techniques, temporary versus permanent groundwater sampling points, soil and groundwater sampling techniques and data evaluation, stable isotope evaluation of natural biodegradation, groundwater flow velocities, groundwater extraction and ex-situ treatment via air stripping and bio-augmented granular activated carbon, and combined soil vapor extraction and air sparging.



Development of Water Balance and Groundwater Modeling, Magnesium Processing and Chemical Production and Distribution Effluent Disposal Facility, Residential Real Estate Development, Basic Remediation Company, Henderson, Nevada

Principal hydrogeologist responsible for the design and oversight of an aquifer testing and soil hydraulic testing program; manage development and QA of analytic and numerical groundwater flow and contaminant fate and transport models; identification and quantification of recharge and discharge sources and sinks for comprehensive site water balance. Evaluated historical mounding at the site.

Installation and Testing of the Vadose Zone Monitoring System, Los Angeles County Sanitation District, Water Reclamation Facility, Effluent Management Site, Palmdale, California

Principal hydrogeologist responsible for installation and testing vadose zone monitoring instrumentation in soils receiving treated water from the Palmdale Water Reclamation Facility to quantify recharge associated with reclaimed wastewater irrigation. Tasks included project management, monitoring system design and instrumentation selection review; monitoring instrumentation testing, calibration, and installation; soil sampling and analysis; field data collection; reporting. Instrumentation included: percolation samplers; pressure/vacuum lysimeters; ECHO soil moisture sensing probes; data loggers.

Fess Parker Vineyards, Santa Ynez Valley, California

Lead scientist for performing infiltration testing of proposed irrigation storage reservoir sites to evaluate potential future leakage and recharge from reservoir.

National Lab Site Characterization, Lawrence Livermore National Laboratory, Livermore, California

Served as reviewer and technical consultant to Lawrence Livermore National Laboratory, designed infiltration experiment to quantify recharge and determine the influence of precipitation on the migration of chemicals, including radionuclides, through the vadose zone. Developed laboratory protocols for hydrologic testing of soil core samples

Heap Leach Mining, Confidential Client, Kingman, Arizona

As principal hydrogeologist, managed installation, testing, and reporting of vadose zone monitoring systems including suction lysimeters and gypsum block arrays for a heap leach mining facility in Kingman, Arizona in order to determine potential chemical impacts of recharge from the heap leach piles.

Vadose Zone Research Laboratory, University of California, Santa Barbara

Conducted research as principal investigator under U.S. EPA cooperative agreement funding and lectured in engineering geology, hydrogeology, geography, and environmental engineering courses on the subject of vadose zone hydrologic processes. Conducted course instruction for upper division course on soil processes.



Vadose Zone Transport Modeling, Spokane Regional Solid Waste Disposal Project, Spokane, Washington

Technical specialist responsible for developing and writing a predictive scenario model to approximate the time-dependent travel distance of a wetting front below a breach in an earthen liner at three potential solid waste landfill disposal sites. The modeled scenarios were used to predict potential site chemical impacts associated with direct recharge of future landfill leachate.

U.S. EPA, Santa Barbara, California

As principal investigator supervised a comparison of three functional forms for representing soil moisture characteristic curves.

Evaluation of Remediation Options for Legacy Contaminants in Lakebed Sediment, Private Land Owner, McGrath Lake, Ventura County, California

Principal hydrogeologist and technical reviewer responsible for oversight for evaluating options for compliance with a California State total maximum daily load regarding pesticides and polychlorinated biphenyls (PCBs) bound to lakebed sediments, evaluation of remedial options, regulatory agency interaction.

Low-level Radioactive Waste Disposal, EG&G, Rocky Flats Nuclear Manufacturing Plant, Golden, Colorado

Technical specialist responsible for design of a vadose zone characterization and monitoring program. Identified contaminant release sources, developed conceptual model of the subsurface geology, developed water balance, sources and sinks for recharge and discharge, mechanisms and pathways for contaminant migration, candidate remedial approaches, and viable monitoring approaches during closure and post closure. Contaminants of concern included nitrates and a variety of actinides.

Natural Resource Inventory, Santa Cruz, Inc., Cazadero, California

As principal, performed investigation of the geologic, hydrologic, soils, and biological resources on a 3,000-acre ranch in northern California and wrote a plan to develop the water resources and a profitable agricultural enterprise.

Agricultural and Irrigation Management, Various Private and Corporate Farms, Montana and South Dakota

Lead scientist supervising an interdisciplinary team that studied and consulted in the areas of dryland soil water management, irrigation management, and the use and management of pesticides.

Vadose Zone Modeling, FMC Corp., Multiple Locations, USA

Project hydrogeologist for forensic data analysis, vadose zone fate and transport modeling, insurance cost recovery evaluation.

Basin-scale Groundwater Investigation, Confidential Client

Principal hydrogeologist for basin-scale groundwater investigation, vadose zone source identification, forensic data analysis, flow and perchlorate transport analysis, source identification, remediation alternatives study, regulatory negotiation, client consultation.



Vadose Zone Monitoring, U.S. EPA, Alton, Missouri

Technical Specialist for the demonstration and installation of a vadose zone monitoring system at a Superfund hazardous waste land treatment site for polychlorinated biphenyls (PCB).

Tritiated Water Vapor Diffusion, University of California, Santa Barbara

Principal Investigator responsible for the design of an experiment to measure diffusion coefficients of tritiated water vapor in undisturbed soil cores.

Geographic Information System, Multiple Agencies, Santa Barbara County, California

Principal investigator for development of an interagency cooperative agreement between University of California, Santa Barbara, U.S. Environmental Protection Agency, the U.S. Bureau of Reclamation, and the U.S. Air Force Space Command to develop GIS suitable for use in decision-making in ground water and vadose zone characterization and remedial investigations.

Geographic Information System, Vandenberg Air Force Base

Principal investigator responsible for conducting a one-day GIS workshop at Vandenberg Air Force Base (VAFB) on developing groundwater and vadose zone remedial action plans. Subsequently managed development of GIS suitable for use in decision-making in groundwater and vadose zone characterization and remedial investigations. Designed a GIS to facilitate remediation of approximately 1,000 underground storage tanks (USTs) at VAFB. Reviewed Bureau of Reclamation field investigation strategies and protocols and served in a training capacity with respect to vadose zone hydrogeology.

Lysimeter Evaluation, U.S. Environmental Protection Agency

Principal investigator for evaluating use of pressure-vacuum lysimeters for obtaining representative vadose zone water samples containing volatile organic compounds.

Reclaimed Water Irrigation, Facilities Management, University of California, Santa Barbara

Principal investigator for feasibility study of using reclaimed wastewater for landscape irrigation.

Hydrologic, Soil and Geotechnical Research, U.S. Forest Service, Libby, Montana; Darby, Montana; Bozeman, Montana

As assistant research scientist, designed, conducted, and wrote research on the effect of heavy machine traffic on the hydrologic, chemical, physical, and engineering properties of compacted soils. Performed infiltration testing using double ring infiltrometers in three major areas of western Montana. Lectured to introductory soil science classes and soil physics laboratory sessions on quantitative field assessment of hydrologic cycle components.

Geologic, Hydrologic, and Soil Resource Inventory, Tongass National Forest, U.S. Forest Service, Sitka, Alaska

Project scientist for watershed resources survey and conducted project level planning. Wrote technical manuals on slope stability, floodplain logging, and soil and hydrologic survey work. Co-authored the first detailed soils maps of northeast Chichagof and Admiralty Islands, Southeast Alaska.



Hydrologic and Soil Resource Inventory, U.S. Bureau of Land Management, Salem, Oregon

Assistant project scientist for conducting watershed surveys and wrote a soils handbook and map of the Mollala area and watershed in the Western Cascades with associated management guidelines. Developed a detailed map of road engineering features that resulted in stream sediment loading.

Environmental Services Projects

Comprehensive Assessment of Multiple-sourced Chlorinated Solvent Indoor Air Vapor Intrusion Risk to Multiple Residential Dwellings, Santa Barbara, California

Principal hydrogeologist for the evaluation of a complex soil vapor plume that resulted from chemical releases by multiple commercial sources and by a city sanitary sewer system that “snaked” through the neighborhood. Dozens of apartment buildings and single-family dwellings were potentially exposed to indoor air intrusion by vapors off-gassing from an approximate 50-year-old, 24-acre chlorinated solvent groundwater plume. Dr. Cullen directed the field methodology, analytic approach, risk assessment, and regulatory interactions that were collectively used to address and resolve the problem of indoor air intrusion exposure risk to residents in the neighborhood. Though preliminary screening methods indicated potentially significant neighborhood-wide exposure, comprehensive assessment through vapor sample network design, site physical properties characterization, meticulous monitoring, vapor intrusion (VI) modeling, VI risk assessment, adherence to CalEPA guidance, and regulatory interaction was used to determine that VI mitigation was currently not needed and periodic monitoring will be implemented until VI source removal is achieved. Dr. Cullen is currently developing of VI source (groundwater) remedial designs and directing a public participation program.

Vapor Intrusion Evaluation and Risk Assessment, Confidential Client, Los Angeles County, California

Principal technical lead in vapor intrusion assessment of historic petroleum hydrocarbon sources at a low-income housing complex in Los Angeles County. Directed expert site exposure assessment and vapor intrusion modeling conducted in support of a legal matter. Vapor intrusion modeling was used to predict indoor air vapor concentrations in presence of liquid petroleum hydrocarbons, and compared to ambient air concentrations in anticipation of trial testimony.

Remedial Investigation/Feasibility Study Remedial Alternatives, Operable Unit No. 2, Brown & Bryant Superfund Site, Arvin, California

Principal hydrogeologist for evaluation and comment as to the technical and financial feasibility of conducting Pump and Treat in a shallow aquifer, Monitored Natural Attenuation (MNA) in a deeper aquifer, and removal of a deep municipal supply well as a mean of remediation and prevention of exposure to chloroform, 1,2-DBCP, 1,2-DCP, 1,3-DCP, Dinoseb, EDB, and 1,2,3-TCP. Task included: remedial cost evaluation; historic geologic/hydrogeologic data evaluation; municipal well abandonment protocols evaluation and recommendation; surface cap effectiveness evaluation; surface runoff evaluation; fate and transport analysis. Comments submitted to U.S. EPA on behalf of client.

Pesticide Formulation and Distribution Site, Great Lakes Chemical, Irvine, California

Principal project hydrogeologist responsible for site subsurface investigation (soil, soil vapor, and groundwater sampling and analysis), litigation support, fate and transport analysis, and forensic data evaluation. Developed liability allocation scheme. Favorable settlement achieved.



CERCLA-Compliant Hydrogeologic Characterization, Magnesium Processing and Chemical Production and Distribution Effluent Disposal Facility, Basic Management, Inc., Henderson, Nevada

Lead hydrogeologist for program to characterize impacted soil and groundwater on a 2,332-acre redevelopment site including: Interpretation of geologic, soil, groundwater, hydrologic, chemical, and geotechnical data to support the description of the conceptual site model; design and oversight of intrusive field investigation utilizing multiple drilling techniques; characterization of multiple aquifers; development of site-specific soil background concentrations for metals (including arsenic) and radiochemicals; design and oversight of an aquifer testing and soil hydraulic testing program; manage development and QA of analytic and numerical groundwater flow and contaminant fate and transport models; chemicals of concern included metals, volatile and semivolatile organics; salts; Organochlorine and Organophosphate pesticides, perchlorate, and radionuclides; participation in public accountability meetings with technical, legal, and public representatives of State, County, and City governments, other potentially responsible parties, and the local citizen Remediation Advisory Board; database and GIS development and support. The Site Closure Plan was approved by Nevada Division of Environmental Protection.

CERCLA-Compliant Hydrogeologic Characterization, Corrective Action Management Unit (CAMU) Basic Management, Inc., Henderson, Nevada

Lead hydrogeologist for program to characterize impacted soil and groundwater in support of permitting of a 114-acre Corrective Action Management Unit proposed to receive waste soils resulting from remediation of a nearby redevelopment site. Work included: Interpretation of geologic, soil, groundwater, hydrologic, chemical, and geotechnical data to support the description and reporting of the hydrogeologic conceptual site model; design and oversight of intrusive field investigation utilizing multiple drilling techniques; characterization of multiple aquifers; development of site-specific soil background concentrations for metals (including arsenic) and radiochemicals; fate and transport analysis of Site and Off-Site impacts; review and analysis of groundwater treatment system performance; participation in public accountability meetings with technical, legal, and public representatives of State, County, and City governments, other potentially responsible parties, and the local citizen Remediation Advisory Board; and database and GIS development and support.

Investigation of Soil and Groundwater Impacts due to Drycleaner Solvent Releases, Berkeley, California

Principal hydrogeologist for the investigation to determine the presence of perchlorate (PCE) and evaluate the sources and timing of release; prepared expert opinion report; deposition testimony.

Evaluation of Chlorinated Solvents Emanating from GBF/Pittsburg Landfill Potential Vapor Intrusion (VI) Evaluation and Risk Assessment, Seeno Construction, Antioch, California

Principal hydrogeologist for the evaluation of factors affecting soil vapor migration and the adequacy of the soil vapor characterization that had been conducted at the site (taking into account anticipated applicable regulatory requirements of the California Environmental Protection Agency [Cal/EPA]). Evaluated technical feasibility and cost of remedies required to mitigate (1) the chemical impacts to groundwater and (2) the current and potential future chemical vapor intrusion impacts to and below proposed development property were evaluated. Determined that migration of chemical vapors in the vadose zone, combined with migration of volatile organic compounds (VOCs) in the groundwater and



subsequent vaporization into the overlying soils, were resulting in VOC concentrations that presented a significant threat to future residents of the proposed development. Provided expert report; deposition testimony.

Principal Hydrogeologist, Investigation of Soil and Groundwater Impacts due to Drycleaner Solvent Releases in Woodland, California

As principal hydrogeologist, conducted a forensic investigation to determine the presence of dense nonaqueous-phase liquid and evaluate its sources; evaluated the feasibility of, developed a conceptual remedial design, and estimated costs of remediation; prepared expert opinion report.

Investigation of Historic Sources of Solvent Releases, Crown City Plating Company, El Monte, California

As principal hydrogeologist, provided historical review and evaluation of soil, soil vapor, and groundwater data to determine the location and timing of solvent releases relative to insurance coverage in place during the period of operational activity. Provided consultation and expert trial testimony.

Remedial Alternatives Evaluation of VOC-Impacted Soils, Confidential Client, Richmond, California

Principal hydrogeologist for the evaluation of the technical and financial feasibility of conducting 1) In-Situ Thermal Desorption (ISTD) and 2) Excavation with Off-Site Disposal to remediate chlorinated hydrocarbons at a site adjacent to the San Francisco Bay ("bay muds") and slated for redevelopment. Tasks included: current and historical geologic/hydrogeologic data evaluation; calculation of seepage velocity; evaluation of the presence of dense nonaqueous phase liquid; evaluate compliance with CERCLA and the National Contingency Plan (NCP); remedial cost estimation and evaluation; estimation of remedial volumes and removed groundwater; evaluate remedial performance monitoring alternatives; evaluate compliance with Regional Water Quality Control Board orders. Settlement achieved, and the Site is undergoing redevelopment.

Chlorinated Hydrocarbon Site Characterization, Remediation, and Cost Evaluation, Rockwell Collins, Santa Ana, California

Principal hydrogeologist for the evaluation of historical environmental sampling data and interpreted fate and transport of site constituents at a former electronics and aerospace manufacturing facility operational since 1959; researched historical regulatory & commercial documents to interpret use of chemicals at site; evaluated site characterization data to adequacy as the basis for remedial cost estimation; prepared remedial action plan that proposed enhanced bioremediation of perchlorate (PCE), tetrachloroethene (TCE), Freon-113 and related breakdown products; provided an federal court expert opinion report and deposition testimony; directed groundwater flow (MODFLOW96) and PCE transport (MT3DMS) modeling (GWVISTAS pre/post processor) to quantify PCE travel time to the supply well perforations under various assumed hydraulic conditions; client achieved favorable settlement.

Environmental Site Assessments, Nationwide Portfolio, Evercore Trust Corporation

Principal Hydrogeologist and signatory, ASTM-compliant Phase I and II environmental site assessments (ESAs) for over 100 nationally-branded convenience store properties. Oversaw proposal preparation, identification,



vetting and oversight of subcontractors, data analysis, and report preparation. For Phase I ESAS, oversaw site visits, database and cartographic information review to identify environmental conditions requiring further investigation. Directed and signed reports detailing the investigation findings and recommendations. For Phase II ESAs, oversaw soil vapor surveys, geophysical searches for unidentified underground storage tanks, data analysis, vapor intrusion risk analysis, and reports.

Salt Plume Monitoring, Former Alcoa Facility, Fontana, California

Oversight and signatory for long-term semiannual groundwater monitoring of salt and total dissolved solids concentrations beneath a site cap designed to mitigate leaching of salts. Interpret site data and investigate possible additional area-wide upgradient sources of salts that may be impacting the site groundwater.

Technical Specialist, CERCLA Remedial Investigation, Pantex Plant, Department of Energy, Carson County, Texas

Technical Specialist for feasibility study and implementation, conceptual site model development, design, test and implement soil vapor extraction system for chlorinated hydrocarbon soil impacts. Remediation Operation and maintenance is ongoing.

Design and Implementation of Innovative In-Situ Perchlorate/Tetrachloroethene Remediation, Garden Plaza, Santa Barbara, California

Technical Specialist for in-situ remediation of perchlorate/ tetrachloroethene via electron donor injection in a guaranteed-price remediation program in support of Site redevelopment. Site closure granted by Regional Water Quality Control Board and site was redeveloped as retail shopping center.

Chlorinated Hydrocarbons, Aerospace and Electronics manufacturing, Litton Industries, Santa Clara, California

As principal project hydrogeologist, performed forensic data evaluation, fate and transport analysis, and expert testimony. Settlement achieved.

Principal Hydrogeologist, Chlorinated Hydrocarbons, Norvell Bass Dry Cleaner, Santa Barbara, California

Site characterization, remedial design development, cost allocation, and expert testimony. Settlement achieved. Site is currently undergoing redevelopment.

Chlorinated Hydrocarbons, Law Office of DeLoreto and DeLoreto, Dutch Maid Dry Cleaners, Santa Barbara, California

Principal project hydrogeologist responsible for RCRA remedial investigation, dense nonaqueous phase liquid sampling, limited access indoor soil matrix and soil vapor sampling, development of site conceptual model, aquifer testing, groundwater monitoring well network design, geologic fault investigation, feasibility study, remedial design, treatability study, soil vapor pilot testing, soil excavation, indoor air sampling, forensic data evaluation, fate and transport analysis, expert testimony, and regulatory negotiation. Settlement achieved.

Chlorinated Hydrocarbons, Aerospace Manufacturing Site, Hawker Pacific, Inc., Sun Valley, California

Principal project hydrogeologist responsible for RCRA remedial investigation, remedial alternatives study, regional hydrogeologic and contaminant plume investigation, multi-phase/multi-dimensional



vadose zone modeling (Tracer 3D), litigation support, and presentation to Special Master. Site closure achieved; favorable settlement achieved.

Former Aerospace Manufacturing Facility, AlliedSignal, Los Angeles, California

Principal project hydrogeologist responsible for RCRA remedial investigation, feasibility study, fate and transport analysis (including assessment of the effects of the West Coast Basin saltwater intrusion barrier wells), and conceptual remedial action plan of soils and multiple aquifers impacted by chlorinated hydrocarbons, petroleum hydrocarbons, and 1,4-dioxane adjacent to LAX. Evaluation of historic aquifer testing data. Evaluation of offsite impacts; evaluation of potential downgradient liabilities. Pilot and treatability testing included soil vapor extraction, dual phase extraction, groundwater circulation wells, and enhanced in-situ bioremediation followed by polishing with monitored natural attenuation. Remedial action objectives successfully negotiated with LA Regional Water Quality Control Board.

Former Aerospace Facility, AlliedSignal Aerospace Equipment Systems, Rancho Dominguez, CA

Project hydrogeologist responsible for RCRA remedial investigation to delineate the extent of chlorinated volatile organic compound impacts to groundwater and the feasibility of remediation by monitored natural attenuation. Site closure achieved.

Tetrachloroethene Investigation, Joplin, Missouri

Principal project hydrogeologist responsible for fate and transport analysis in area of karst hydrogeology, litigation support at a ball bearing manufacturing site.

Chlorinated Hydrocarbons, Historic Manufacturing Activities, Confidential Regional Medical Center, Los Angeles Metro Area, California

Principal project hydrogeologist for real estate development due diligence and acquisition consultation, property historical research, environmental compliance assessment, streamlined feasibility study and remedial cost estimation; developed 3-scenario remedial economic/risk analysis. Property purchased.

Wastewater Holding Pond Evaluation, Confidential Wastewater Agency, California

Principal hydrogeologist for the evaluation of the integrity of wastewater pond liners; evaluate potential impacts of pond effluent on vicinity water production wells; development of monitoring program to evaluate groundwater quality over time; reporting and consultation with staff and Board of Directors.

Basin-Scale Perchlorate Groundwater Investigation, Confidential Client

Principal hydrogeologist for basin-scale groundwater investigation, vadose zone source identification, forensic data analysis, flow and transport analysis, source identification, remediation alternatives study, regulatory negotiation, client consultation.

Waste Soil Pile Remedial Investigation, Gibson Superfund Site, Bakersfield, California

Principal hydrogeologist responsible for CERCLA-based remedial investigation at a former waste recycling/treatment facility for soils impacted by metals, volatile organic compounds chlorinated



hydrocarbons, petroleum hydrocarbons, fuel oxygenates, semivolatile organic compounds, polynuclear aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), pesticides, and herbicides. Developed an innovative field-sampling plan using a custom-made hybrid between a direct push rig and an extending fork lift to extract samples. Conducted a statistical analysis of the sampling data used to identify the appropriate method of waste disposition. Remediation by excavation and off-site treatment. Communicated with potentially responsible parties group and negotiated statistical interpretation methods with the Department of Toxic Substances Control.

Former Illegal Methamphetamine Lab, Solvang, California

Principal hydrogeologist for forensic data analysis, regulatory negotiation, and assisted client with closeout of regulatory case file. Residential redevelopment proceeded.

EG&G, Rocky Flats Nuclear Manufacturing Facility, Colorado

Technical specialist and principal reviewer of performance evaluation modeling of vadose zone and groundwater modeling to assess the local water balance, recharge, and the viability of remediation by entombment of radionuclides and mixed wastes under alternative cap at low-level radioactive waste disposal site, Rocky Flats plant, Colorado.

Metals Soil Column Study, Springfield Township Committee, Springfield, Michigan

Principal investigator and manager of controlled laboratory study to design, implement, and report on comparison of soil column leaching to the Synthetic Precipitation Leachate Procedure batch testing methodology (EPA Method 1312). Demonstrated attenuation of metals and polychlorinated biphenyls (PCBs) within soil media through soil sorption. The results were used in an analysis of potential site chemical impacts associated with direct recharge of precipitation.

Remediation of Lead-Impacted Soils, Havlik Group, Santa Barbara, California

Principal hydrogeologist for site investigation, regulatory negotiations, risk assessment, statistical analysis, groundwater monitoring, fate and transport analysis, and remedial action plan developed to conduct hot spot excavation beneath existing structure.

Metals Soil Column Study, Springfield Township Committee, Springfield, Michigan

Principal investigator responsible for managing a controlled laboratory study to design, implement, and report on comparison of soil column leaching to the Synthetic Precipitation Leachate Procedure batch testing methodology (U.S. EPA Method 1312). Demonstrated attenuation of metals and polychlorinated biphenyls (PCBs) within soil media through soil sorption.

Tritium Migration Modeling, Brookhaven National Laboratory, Upton, New York

As technical specialist, provided analytic model of advective and diffusive vadose zone transport, modeled vadose zone travel times, and provided opinion of the significant factors affecting tritium migration beneath the High Flux Beam Reactor at Brookhaven National Laboratories.



Chlorinated Hydrocarbons, Historic Manufacturing Activities, Confidential Regional Medical Center, Los Angeles Metro Area

Principal project hydrogeologist for real estate development due diligence and acquisition consultation, property historical research, environmental compliance assessment, streamlined feasibility study and remedial cost estimation; developed three-scenario remedial economic/risk analysis. Property purchased.

Texaco Exploration and Production, Inc., Santa Maria California

Principal hydrogeologist for site characterization, feasibility study, remedial action plan, statistical sampling design and analysis, modeling, expert testimony, oilfield restoration and real estate development. Site closure and redevelopment achieved. Jury verdict rendered. Trial defense named one of the Top 20 Defense Cases in 2002 by the National Law Journal.

Single Shell Tank Integrity Program, Department of Energy, Hanford, Washington

Expert hydrogeologist on expert panel examining potential effects and mitigation of leaks from tanks storing approximately 54,000,000 gallons of mixed high-level and low-level radioactive waste with other hazardous and non-hazardous waste.

CERCLA-Compliant Hydrogeologic Characterization, Magnesium Processing and Chemical Production and Distribution Effluent Disposal Facility, Basic Management, Inc., Henderson, Nevada

Lead hydrogeologist for program to characterize impacted soil and groundwater on a 2,332-acre redevelopment site including: Interpretation of geologic, soil, groundwater, hydrologic, chemical, and geotechnical data to support the description of the conceptual site model; design and oversight of intrusive field investigation utilizing multiple drilling techniques; characterization of multiple aquifers; development of site-specific soil background concentrations for metals and radiochemicals; design and oversight of an aquifer testing and soil hydraulic testing program; manage development and quality assurance of analytic and numerical groundwater flow and contaminant fate and transport models; participation in public accountability meetings with technical, legal, and public representatives of State, County, and City governments, other potentially responsible parties, and the local citizen Remediation Advisory Board; database and GIS development and support. Site Closure Plan approved by Nevada Division of Environmental Protection (NDEP).

CERCLA-Compliant Hydrogeologic Characterization, Corrective Action Management Unit, Basic Management, Inc., Henderson, Nevada

Lead hydrogeologist for program to characterize impacted soil and groundwater in support of permitting of a 114-acre Corrective Action Management Unit (CAMU) proposed to receive waste soils resulting from remediation of a nearby redevelopment site. Work included: Interpretation of geologic, soil, groundwater, hydrologic, chemical, and geotechnical data to support the description and reporting of the hydrogeologic conceptual site model; design and oversight of intrusive field investigation utilizing multiple drilling techniques; characterization of multiple aquifers; development of site-specific soil background concentrations for metals and radiochemicals; fate and transport analysis of Site and Off-Site impacts; review and analysis of Groundwater Treatment system performance; participation in public accountability meetings with technical, legal, and public representatives of State, County, and City governments, other potentially responsible parties, and the



local citizen Remediation Advisory Board; database and geographic information system (GIS) development and support..

Remediation of Lead-Impacted Soils, Havlik Group, Santa Barbara, California

Principal hydrogeologist for site investigation, regulatory negotiations, risk assessment, statistical analysis, groundwater monitoring, fate and transport analysis, remedial action plan developed to conduct hot spot excavation beneath existing structure.

Remedial Alternatives Evaluation of VOC-Impacted Soils, Confidential Client, Richmond, California

Principal hydrogeologist for the evaluation of the technical and financial feasibility of conducting 1) In-Situ Thermal Desorption (ISTD) and 2) Excavation with Off-Site Disposal to remediate chlorinated hydrocarbons at a site adjacent to the San Francisco Bay ("bay muds") and slated for redevelopment. Tasks included: current and historical geologic/hydrogeologic data evaluation; calculation of seepage velocity; evaluation of the presence of DNAPL; evaluate compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP); remedial cost estimation and evaluation; estimation of remedial volumes and removed groundwater; evaluate remedial performance monitoring alternatives; evaluate compliance with Regional Water Quality Control Board orders. Settlement achieved, and the Site is undergoing redevelopment.

Remedial Investigation/Feasibility Study Remedial Alternatives, Operable Unit No. 2, Confidential Client, Brown & Bryant Superfund Site, Arvin, California

Principal hydrogeologist for providing evaluation and comment as to the technical and financial feasibility of conducting pump and treat in a shallow aquifer, monitored natural attenuation (MNA) in a deeper aquifer, and removal of a deep municipal supply well as a mean of remediation and prevention of exposure to chloroform, 1,2-DBCP, 1,2-DCP, 1,3-DCP, Dinoseb, EDB, and 1,2,3-TCP. Tasks included remedial cost evaluation; historic geologic/hydrogeologic data evaluation; municipal well abandonment protocols evaluation and recommendation; surface cap effectiveness evaluation; surface runoff evaluation; fate and transport analysis. Comments submitted to U.S. Environmental Protection Agency on behalf of client.

Design and Implementation of Innovative In-Situ Trichloroethylene Remediation, Garden Plaza, Santa Barbara, California

Technical specialist for in-situ remediation of tetrachloroethene (TCE) via electron donor injection in a guaranteed-price remediation program in support of site redevelopment. Site closure granted by Regional Water Quality Control Board and site has been redeveloped as retail shopping center.

Innovative Reduction of Ammonia Immediately Dangerous to Life or Health (IDLH) and Safety Hazard, Equilon Lube Plant, Carson, California

Designed in-situ vadose zone remediation via hydrolysis used to induce transformation of the ammonia gas to the nongaseous ammonium at an industrial redevelopment site. Ammonium was oxidized to nitrate that subsequently served as electron acceptor for biodegradation of benzene in underlying groundwater. Immediately Dangerous to Life or Health (IDLH) conditions removed such that Level D excavation and redevelopment activities proceeded.



Chlorinated Hydrocarbons, Aerospace and Electronics manufacturing, Litton Industries, Santa Clara, California

Principal project hydrogeologist for forensic data evaluation, fate and transport analysis, expert testimony. Settlement achieved.

Chlorinated Hydrocarbons, Aerospace Manufacturing Facility, Rockwell Collins, Santa Ana, California

Principal hydrogeologist for site characterization, forensic data evaluation, remedial design development, remedial action plan, remedial cost estimation, expert testimony at redeveloped industrial site. Settlement achieved.

Chlorinated Hydrocarbons, Law Office of DeLoreto and DeLoreto, Dutch Maid Dry Cleaners, Santa Barbara, California

Principal project hydrogeologist for Resource Conservation and Recovery Act (RCRA) remedial investigation, dense non-aqueous phase liquid or (DNAPL) sampling, limited access indoor soil matrix and soil vapor sampling, development of site conceptual model, aquifer testing, groundwater monitoring well network design, geologic fault investigation, feasibility study, remedial design, treatability study, soil vapor pilot testing, soil excavation, indoor air sampling, forensic data evaluation, fate and transport analysis, expert testimony, regulatory negotiation. Settlement achieved.

Gasoline Service Stations, Petroleum Hydrocarbons, UNOCAL, Stockton, California

Principal project hydrogeologist for Resource Conservation and Recovery Act (RCRA) remedial investigation, remedial alternatives evaluation for petroleum hydrocarbons, corrective action plan development, intrinsic bioremediation study, regional hydrogeologic characterization, evaluation of saltwater intrusion, client consultation, expert testimony to California State Water Resources Control Board. Site granted monitored natural attenuation (MNA) status.

Petroleum Hydrocarbons, Kern County School District, Bakersfield, California

Principal project hydrogeologist for Resource Conservation and Recovery Act (RCRA) remedial investigation, feasibility study, soil vapor/air sparging extraction pilot test, in-situ bioremediation.

Irvine Bus Base Closure, Orange County Transit Authority, Irvine, California

Principal project scientist for groundwater monitoring, geochemical analyses and evaluation for bioattenuation activity, free product removal evaluation, methyl tertiary-butyl ether (MTBE) evaluation, dissolved phase diesel plume remediation, regulatory negotiations. Site closure achieved.

Intrinsic Remediation Sites, Texaco, Victorville, California; Roadway, Fresno, California

Principal hydrogeologist responsible for demonstrating viability of intrinsic natural attenuation mechanisms at two operating service stations (Texaco) and an operating trucking terminal (Roadway) to remediate petroleum hydrocarbons. Used innovative monitoring networks including soil vapor monitoring, barometric and thermal monitoring, neutron monitoring, and numerical fate and transport modeling that coupled vadose zone and groundwater transport. Site closures achieved.



Refinery Remediation, Bakersfield Refinery, Bakersfield, California

Designed a pilot soil vapor extraction test along with vapor recovery by condensation and return to refinery operations; developed final design of a remediation recovery system for petroleum reformat e impacting the vadose zone and groundwater (annual fluctuations up to 100 feet). Final extraction system design addressed impacted soils 90 feet deep over an area 25 acres in size. Enhanced by air sparging, the system has recovered over 1.5 million gallons of petroleum reformat e from the well field.

Waste Soil Pile Remedial Investigation, Bakersfield, California

Directed Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-based remedial investigation at a former waste recycling/treatment facility for soils impacted by metals, volatile organic compounds (VOCs), chlorinated hydrocarbons, petroleum hydrocarbons, fuel oxygenates, semivolatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), pesticides, and herbicides. Developed an innovative field-sampling plan using a custom-made hybrid between a direct push rig and an extending fork lift to extract samples. Conducted a statistical analysis of the sampling data used to identify the appropriate method of waste disposition. Remediation by excavation and off-site treatment. Communicated with potentially responsible parties (PRP) group and interacted with Department of Toxic Substances Control (DTSC).

DTSC California School Siting, William S. Hart Union School District, Santa Clarita, California

Technical specialist and reviewer for Preliminary Endangerment Assessment (PEA). Project challenges included: rugged inaccessible terrain; oil drilling and production, and explosives manufacture and testing on adjacent properties; active community participation in the siting process; and an aggressive overall construction schedule. Ambient air monitoring systems were deployed at strategic site locations. Over 100 soil and 150 soil-gas samples collected from over 50 borings within and around the 50-acre school site. Based on the project findings, the school district funded the final construction of the school.

Trichloroethylene, Joplin, Missouri

Principal project hydrogeologist for ball bearing manufacturing site, fate and transport analysis in area of karst hydrogeology, litigation support.

Pesticide Formulation and Distribution Site, Great Lakes Chemical, Irvine, California

Principal project hydrogeologist for fate and transport analysis, forensic data evaluation. Allocation of liability.

Lawrence Livermore Reports, State of California

Collaborating principal investigator and co-author for State Water Resources Control Board, University of California and Lawrence Livermore National Laboratory Study, state-wide investigation of leaking underground fuel tanks impact on groundwater. Conducted study that determined that passive bioremediation of petroleum hydrocarbons leaked from underground fuel tanks is an effective alternative to active engineered remediation approaches. As a result of the study, the State Water Resources Control Board recommended to its nine regional water boards that passive remediation



should be considered the primary remediation tool in most cases once the fuel leak source has been removed.

Multi-Agency Petroleum Hydrocarbon Remediation Demonstration Project, Department of Defense (DOD) Sites throughout the State of California

Collaborating Principal Investigator for conducting site inspections and met with base civilian and military personnel. Participated in expert panel demonstration of innovative and alternative risk-based cleanup strategies and recommended alternative innovative remediation approaches to cleanup petroleum hydrocarbons that contaminated soils and groundwater at the respective base sites.

Petroleum Hydrocarbon Fate and Transport, Western States Petroleum Association, California

Initiated study to determine fate and transport of heavy crude oil products and byproducts and coordinated exchange of data with the American Petroleum Institute in Washington, D.C.

Single-Shell Tank Integrity Program, U.S. Department of Energy Facility at Hanford, Washington

Member of panel of experts tasked with providing leak integrity and structural integrity recommendations to guide implementation of an enhanced Single-Shell Tank Integrity Program (SSTIP), for the River Protection Project. The SSTs at Hanford have been used to store up to 56 million gallons of high-level radioactive waste until future site closure is implemented. Dr. Cullen provided expertise on soils and the vadose zone.

Investigation of Historic Sources of Arsenic, Basic Management, Inc., Henderson, Nevada

As principal hydrogeologist, reviewed and assessed the site data, along with historical and current site conditions, to determine if the presence of arsenic is anthropogenic or naturally occurring. Evaluated site geology (including pedogenic, hydrogeologic and geochemical site conditions), summarized and evaluated site use history (including potential anthropogenic sources and potential arsenic mobilization and/or accumulation mechanisms), and conducted supplemental sampling and lab analyses.

National Lab Site Characterization, Lawrence Livermore National Laboratory, Livermore, California

Served as reviewer and consultant to Lawrence Livermore National Laboratory, designed infiltration experiment to determine the influence of precipitation on the migration of chemicals, including radionuclides, through the vadose zone. Developed laboratory protocols for hydrologic testing of soil core samples.

Principal Investigator, Tritiated Water Vapor Diffusion, University of California, Santa Barbara

Designed an experiment to measure diffusion coefficients of tritiated water vapor in undisturbed soil cores.

Landfarm Monitoring System Design, Wood Treatment Facility, Alton, Missouri

Technical specialist responsible for the design and installation of monitoring systems for the evaluation of the efficacy and impact to underlying soils and groundwater of a landfarm constructed to remediate soils at a wood treatment facility. The primary chemicals of concern were polychlorinated biphenyls (PCBs), Pentachlorophenol, and Polycyclic Aromatic Hydrocarbons (PAHs). Also developed instructional



video for the U.S. EPA Region VII Laboratory that demonstrated vadose zone monitoring techniques and methodologies.

Hydrologic Analysis, Kern River Environmental Impact Report, City of Bakersfield, California

Principal hydrogeologist and technical reviewer, providing oversight for quantitative evaluation of groundwater impacts that will result from planned increased Kern River flows through the City of Bakersfield. The 118-year historical record of upstream Kern River flow and water balance modeling was used to project stream channel losses due to evapotranspiration and infiltration, and to evaluate how far downstream flows of various planned magnitudes will reach. A telescoped, customized version of the USGS Central Valley numerical groundwater flow model was used to quantify impacts of river losses to groundwater levels, gradients, flow to municipal well fields, and the impacts of alternative groundwater pumping.

Groundwater-Surface Water Interactions, Santa Maria River, California

Principal hydrogeologist and technical reviewer, providing oversight for evaluation of the effect of surface water flows on local groundwater elevations, and groundwater pumping effects on local surface water flows in an alluvial groundwater basin. Surface water flows occur from both storm runoff, and from controlled releases from Twitchell Reservoir. Reservoir releases are currently conducted to recharge the groundwater system, and the State of California is evaluating the possibility of altering release rates and timing to maintain additional surface water flows for enhancement of endangered species habitat.

Principal Hydrogeologist, Technical Reviewer and Oversight, Evaluation of Remediation Options for Legacy Contaminants in Lakebed Sediment, Private Land Owner, McGrath Lake, Ventura County, California

Principal hydrogeologist and technical reviewer, providing oversight for evaluation of total maximum daily load (TMDLs), sampling and analysis methodologies, and remediation strategies for lakebed sediments impacted by historic agricultural runoff in Ventura County. Chemicals of concern included polychlorinated biphenyls (PCBs) and Organochlorine pesticides. Evaluating options for compliance with a California State TMDL regarding pesticides and PCBs bound to lakebed sediments, evaluation of remedial options, regulatory agency interaction. Remediation strategies included dredging, capping, and monitored natural attenuation. Provided critical commentary to the Los Angeles Regional Water Quality Control Board.

Numerical Groundwater Flow Model Design, Ojai Groundwater Basin, Ojai Basin Groundwater Management Agency, Ojai, California

Provided technical review and quality assurance on development of a basin-scale groundwater model using MODFLOW-SURFACT. Model calibration included transient effects of recharge, groundwater pumpage, and surface water-groundwater interactions. A distributed parameter watershed model (DPWM) was applied to parameterize the groundwater recharge to the groundwater flow model. Model will be used by the agency for groundwater management planning and to understand impacts of various climate and groundwater withdrawal scenarios, including long-term drought, on groundwater levels throughout the basin.



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Hydrogeologic Site Characterization, Confidential Client, Santa Barbara, California

Principal hydrogeologist for the evaluation of conditions conducive to mold invasion in a coastal multi-unit dwelling, hydrogeologic assessment, aerial photo evaluation, calculation of water vapor flux through concrete, and expert testimony. Judgment verdict rendered.

Gasoline Service Stations, Petroleum Hydrocarbons, UNOCAL, Stockton, California

Principal project hydrogeologist for RCRA remedial investigation, remedial alternatives evaluation for petroleum hydrocarbons, corrective action plan development, intrinsic bioremediation study, regional hydrogeologic characterization, evaluation of saltwater intrusion, client consultation, and expert testimony to California State Water Resources Control Board. Site granted monitored natural attenuation status.

Petroleum Hydrocarbon, Kern County School District, Bakersfield, California

Principal project hydrogeologist for RCRA remedial investigation, feasibility study, soil vapor/air sparging extraction pilot test, and in-situ bioremediation.

Irvine Bus Base Closure, Orange County Transit Authority, Irvine, California

Principal project scientist for groundwater monitoring, geochemical analyses and evaluation for bioattenuation activity, free product removal evaluation, Methyl Tertiary Butyl Ether (MTBE) evaluation, dissolved phase diesel plume remediation, and regulatory negotiations. Site closure achieved.

Perchlorate Treatability Study, Edwards Air Force Base, California

Principal hydrogeologist for environmental tracer study of long-term recharge rates in the Mojave Desert using chloride balance method, bomb tritium, chlorofluorocarbon (CFC) profile analysis, and unsaturated flux calculation. Results submitted to U.S. Army Corp of Engineers; presentation to California Groundwater Association.

DBCP Impacts to Groundwater, FMC Corp., Multiple Locations, U.S.A.

Forensic data analysis, vadose zone fate and transport modeling, and insurance cost recovery evaluation.

Principal Scientist and Project Advisor, Soil Removal Action Workplan, Bortz Oil Company, Los Angeles, CA. Developed design for construction and operation of soil vapor extraction system for AOPC-2, Former Bortz Oil Company facility. Removal of benzene and methylene chloride vapor to address vapor inhalation pathway for hypothetical future building construction.

Principal Scientist, Technical Specialist, Vadose Zone Leachability Evaluation, Equilon - Carson Lubricants Plant, Carson, California. Conducted vadose zone leachability evaluation aqueous-phase VOCs using the SESOIL model within the American Petroleum Institute Decision Support System (APIDSS). The modeling involved the use of a water balance algorithm coupling the climatic and soil systems through a statistical description of climatic and hydrologic parameters. Vertical fluid flow is calculated to determine mass loading of chemical constituents to groundwater.



Principal Scientist and Project Advisor, Revised Feasibility Study for Soil and Groundwater, Bortz Oil Company, Los Angeles, CA. Prepared CERCLA-compliant FS to remediate Total Recoverable Petroleum Hydrocarbons, benzene, PCE, TCE, cis-1,2-DCE, and vinyl chloride. Based on site conditions and the potential for future exposure via the vapor intrusion pathway, the selected remedy included institutional controls (restricting use by sensitive receptors), soil vapor extraction, and monitored natural attenuation in the underlying groundwater

Principal Project Hydrogeologist and Team Leader, New York Orion Power Holdings, LLP; Multiple Locations in Arizona, California, Nevada, New Mexico

Project hydrogeologist for power generation asset acquisition due diligence, manage air emissions control evaluation, hydrogeologic environmental site assessment, remedial cost estimation, assess National Pollutant Discharge Elimination System (NPDES) requirements, evaluate seller Environmental Impact Reports (EIRs), participate in asset auction bid preparation, manufactured gas plant, and steam and combustion turbines.

Technical Specialist, Petroleum Hydrocarbon Fate and Transport Analysis, Farmland Industries, Coffeyville, Kansas

As technical specialist, modeled the potential impacts to groundwater of residual vadose zone concentrations of petroleum hydrocarbons at an 85-year old refinery operated by Farmland Industries in Coffeyville, Kansas.

Low-Level Radioactive Waste Disposal, EG&G, Rocky Flats Nuclear Manufacturing Plant, Golden, Colorado

As technical specialist, designed a vadose zone characterization and monitoring program. Identified contaminant release sources, developed conceptual model of the subsurface geology, mechanisms and pathways for contaminant migration, candidate remedial approaches, and viable monitoring approaches during closure and post closure. Contaminants of concern included nitrates and a variety of actinides.

Biosolids Land Application, City of Santa Barbara, Santa Ynez, California

Principal hydrogeologist for the Evaluation of suitability of the land application of dewatered anaerobically digested sewage sludge. Developed model to calculate, assess, and forecast nitrogen balance for the site. Made recommendations for site-specific agronomic loading rate, and determined maximum annual and cumulative biosolids application rates. Designed and implemented a surface-water, groundwater, soils, and soil pore liquids monitoring system.

Vadose Zone Monitoring, U.S. EPA, Alton, Missouri

As technical specialist, demonstrated and installed a vadose zone monitoring system at a Superfund hazardous waste land treatment site for polychlorinated biphenyls (PCB).

Vadose Zone Monitoring, Santa Barbara County, Santa Ynez, California

As principal investigator, provided neutron moderation logs to document background soil moisture conditions in the vadose zone below a leaking underground storage tank contaminating groundwater at Santa Ynez Airport.



U.S. EPA Guidance Document, U.S. EPA, Washington, D.C.

As principal author, wrote guidance document under RCRA Subtitle C entitled "Vadose Zone Monitoring at Hazardous Waste Sites". The work was a compilation of research efforts conducted at the Vadose Zone Monitoring Lab at the University of California, Santa Barbara.

Vadose Zone Monitoring Case Studies, U.S. EPA

As principal author, provided vadose zone monitoring case histories for the purpose of developing an agency position and rationale upon which national vadose zone monitoring regulatory requirements have been developed and promulgated under the RCRA.

Environmental Standards Development, ASTM

As principal author, developed national standards for vadose zone monitoring through ASTM (formerly the American Society of Testing and Materials) and served as task force leader for D-18.04 Hydrologic Properties of Soil - Laboratory Techniques. Authored or co-authored four national standards:

- Standard Test Method for the Determination of a Soil Water Retention Curve by Pressure Plate Extraction, ASTM D2325
- Standard Test Method for the Determination of Soil Water Retention Curve by Pressure Membrane Extraction, ASTM D3152
- Standard Guide to Soil Pore-Liquid Sampling in the Vadose Zone
- Standard Guide to Soil Core Sampling in the Vadose Zone, and reviewed numerous others

Faculty Lecturer, the Science of "World Soils", University of California at Santa Barbara, California

Taught all aspects of Soil Science including soil chemistry, physics, biology, climate, geology, geomorphology, hydrology, soil genesis and morphology, and taxonomy. Lectured three time per week (1 hour), taught three (2-hour) laboratory sessions per week.

Solid Waste Assessment Tests, Kern County, Bakersfield, California

As project scientist, participated in Solid Waste Assessment Tests (SWAT) Investigations, monitoring programs, and closure plans for landfills. Assisted with the preparation of a Report of Waste Discharge, Report of Disposal Site Information, CEQA Documents (Negative Declaration), Auto-Shredder Feasibility Study, and Infectious Waste Feasibility Study. Assisted in preparing detailed site expansion plans for both vertical and horizontal expansion of the landfill. Participated in the completion of a Final Closure Plan, Post-Closure Maintenance Plan, Vadose Zone Monitoring Program Report, Gas Monitoring Program Report, Buffer Zone Evaluation Report, Special Impact Studies, and Supplemental Groundwater Monitoring Report.

Solid Waste Landfill Monitoring, Calaveras County, Angels Camp, California

As principal investigator, supervised installation of an innovative, automated vadose zone monitoring system at a Calaveras County solid waste landfill used remote-deployed neutron probe.



Landfill Monitoring System Design, Johnson Canyon Road Landfill, Monterey County, California

As principal investigator, designed, constructed, and installed a unique vadose zone monitoring system that combined direct pore-liquid, indirect pore-liquid, and soil-gas monitoring techniques with retrofit installations of these monitoring devices completed to depths of more than 300 feet below grade.

Landfill Monitoring System Design, Woodward Clyde, Flagstaff, Arizona

Technical advisor and lead designer for the design and installation of a vadose zone monitoring system at a landfill in Arizona. The design was notable in that it was implemented as a preventative plan and used in lieu of a groundwater monitoring system.

Instrumentation Development, Soilmoisture Equipment Corp., Santa Barbara, California

Managed research and monitoring instrumentation product and market development for applications including hydrogeology, environmental engineering, research, well drilling, oil exploration, and natural resource management in over 50 countries.

Laboratory Soil Hydrologic Studies, Oklahoma, Michigan

As principal laboratory investigator, developed the conductivity-pressure head relationship for mine spoils in Oklahoma and a compacted clay liner in Michigan.

Instrumentation Design and Development, U.S. EPA

Principal investigator conceived an innovative air permeameter in which the soil-water matric potential can be precisely controlled, permitting quantification of soil air permeability under changing pore liquid content conditions. Patent rights accrued to University of California.

Installation and Testing of the Vadose Zone Monitoring System, Los Angeles County Sanitation District, Water Reclamation Facility, Effluent Management Site, Palmdale, California

Installed and tested vadose zone monitoring instrumentation in soils receiving treated water from the Palmdale Water Reclamation Plant. Tasks included: project management, monitoring system design and instrumentation selection review; monitoring instrumentation testing, calibration, and installation; soil sampling and analysis; and field data collection; reporting. Instrumentation included: percolation samplers; pressure/vacuum lysimeters; ECHO soil moisture sensing probes; and data loggers.

Expert Witness Assignments

Summaries of litigation support consultation, expert reports, deposition testimony, California State administrative testimony, various state court trial testimony, and federal court trial testimony available upon request.

Professional Affiliations

- American Ground Water Trust, Board of Directors, 2017-present
- American Society of Testing and Materials, 1985 - 2000
 - Soil and Rock Committee (full voting member)
 - Hydrologic Properties of Soils Subcommittee
 - Chairman of Task Group on Hydrologic Properties of Unsaturated Soils



- Vadose Zone Monitoring Subcommittee
- Waste Disposal Committee
- Environmental Assessment of Commercial Real Estate Transactions Committee
- National Groundwater Association
- Coast Geologic Society
- Groundwater Resources Association of California
- Soil Science Society of America
- Southern California Water Utilities Association
- Ventura Watershed Council

Additional Professional Training

OSHA 40-hour Health and Safety Training

OSHA Hazardous Waste Supervisor Training

Patents

Kramer, John H., L.G. Everett, and S.J. Cullen, 1992. Vadose zone monitoring system having wick layer enhancement, U.S. Patent No. 5,272,910.

Springer, David S., S.J. Cullen, and L.G. Everett, U.S. Patent No. (Pending Patent), University of California Case No. 90-077-1, Device to measure air permeability under variable capillary pressures.

Publications and Presentations

Cullen, Stephen J., 2017. SGMA: Challenges of Sustainably Managing Groundwater, Session Organizer and Moderator, Association of Ground Water Agencies and American Ground Water Trust Annual Conference, Radisson Hotel, Ontario, California, February 15-16, 2017.

Schnaar, G., J. Dodge and S.J. Cullen, 2016 (invited paper). Comprehensive groundwater balance development to characterize selenium loading to surface water channels in Orange County, California. *Journal of Contemporary Research and Education*, Issue 159 p.5-23.

Cullen, S.J., G. Schnaar, and M. Cruikshank, 2016. Groundwater Planning and Estimating Safe Yield in California under the Sustainable Groundwater Management Act. *Hydrology and the Law*, Law Seminars International, Santa Monica, CA, September 16, 2016.

Dodge, J.J., G. Schnaar, and S.J. Cullen, 2015. Selenium Loading from Groundwater to Newport Bay, Orange County, California. Presentation at the Geological Society of America 2015 Annual Meeting, Baltimore, Maryland. November 1, 2015.



- Umstot, T., Schnaar, G., Blandford T.N., Cullen, S., Kaiser, P., Ayarbe, J., 2015. Recharge estimates from a soil water-balance model improve groundwater model calibration. Presentation at the MODFLOW and More 2015: Modeling a Complex World conference. May 31 - June 3, 2015. Golden, Colorado.
- Cullen, Stephen J, J. Kelsey, and J. Kay, 2014. Vadose Zone Flow and Transport - Principles and Practices in Mining Applications, a workshop presented at Golder Geotechnical Laboratory, Lima, Peru, November 17, 2014.
- Cullen, Stephen J, J. Kelsey, and J. Kay, 2014. Vadose Zone Flow and Transport - Principles and Practices in Agricultural Applications, a workshop presented at SGS Academy, Centro de Formación, Lima, Peru, November 14, 2014.
- Cullen, Stephen J., 2014. Participant in technical roundtable "Critical Technical Issues Lawyers Should Know Regarding Vapor Intrusion Claims". American Bar Association Section of Environment, Energy, and Resources' 22nd Annual Fall Conference, Miami, Florida, October 10, 2014.
- Cullen, Stephen J., Dodge, J., Peng, J. 2014. Drainage Channels Remobilize Selenium, Swamp of the Frogs, Newport Bay Watershed, Orange County, California. Groundwater Resources Association of California, Groundwater Issues and Water Management, Strategies Addressing Challenges of Sustainability and Drought in California, Sacramento, California. March 4 - 5, 2014.
- Cullen, Stephen J., Kay, J., Chianello, A.R., Pearce, C.L. 2014. Hydrologic Effects of the Kern River Flow and Municipal Water Program. Groundwater Resources Association of California and the United States Committee on Irrigation and Drainage Groundwater Issues and Water Management— Strategies Addressing the Challenges of Sustainability in California. Sacramento, California. March 4 - 5, 2014.
- Cullen, Stephen J., 2013. Comprehensive Assessment of Multiple-sourced Chlorinated Solvent Vapor Intrusion Risk to Multiple Residential Dwellings, Utility Solid Waste Activities Group (USWAG), Remediation and Response Committee, Technical Symposium, Edison Electric Institute, Washington, DC, April 23, 2013.
- Molina, April, G. Schnaar, P. Kaiser, and Stephen J. Cullen, 2012. Preparing Geospatial Data for Use in Watershed and Groundwater Models. ESRI, Southwest Users Group, Albuquerque, New Mexico, October 8-11, 2012.
- Kaiser, Phil, T. Umstot, G. Schnaar, Stephen J. Cullen, 2012. The Distributed Parameter Watershed Model for Predicting Recharge in Southern California. Groundwater Resources Association of California, 21st Annual Meeting and Conference, "California Groundwater: Data, Planning and Opportunities" October 4-5, 2012, Rohnert Park, California.
- Dodge, J.J., G. Schnaar, S.J. Cullen, and J. Peng. 2012. Water Balance Development to Characterize Selenium Flux, Newport Bay Watershed, Orange County, California . Groundwater Resources



Association of California - Salt and Nitrate in Groundwater: Finding Solutions for a Widespread Problem, June 13-14, Fresno, CA.

- Dodge, John J., Stephen J. Cullen, and Ranajit Sahu, 2011. Evaluation of Hydrogeologic Zone Connectivity Using Radioactive and Stable Isotopes, Henderson, NV. Groundwater Resources Association of California (GRAC) Symposium on Environmental Forensics in an Era of Emerging Diagnostic Methods , Irvine, California, April 12, 2011.
- Cullen, Stephen J. and John Kay, 2011. The Vadose Zone: Recharge and Water Quality Improvement Opportunities. Invited presentation to the American Groundwater Trust, February 8, 2011, Annual Conference on Water Resources Issues in Southern California: Recharge Dilemmas for Water Managers, Ontario, California.
- Booth, Derek B., Stephen J. Cullen, and John Kay, 2011. Stream Restoration, Groundwater Use, and Flow Maintenance: Water Management Dilemmas. Invited presentation to the American Groundwater Trust, February 8, 2011, Annual Conference on Water Resources Issues in Southern California: Recharge Dilemmas for Water Managers, Ontario, California.
- Stephens, D.B., S.J. Moore, S.J. Cullen, A. Standen, and L. Jong. 2010. Augmenting groundwater supplies using rain water harvesting. Presentation at the National Ground Water Association Ground Water Summit and Ground Water Protection Council Meeting. April 11-15, 2010, Denver, Colorado.
- Schnaar, Gregory, and S. Cullen, 2009. The Hydrology of Geologic Sequestration. Southwest Hydrology, Vol. 8, No. 5, September/October 2009.
- Stephens, D.B., L. Jong, A. Standen, S. Moore, and S. Cullen. 2009. Roof Water Harvesting for Artificial Recharge in the Americas. Presentation at the National Ground Water Association Groundwater for the Americas. June 8-10, 2009, Panama City, Panama.
- Kear, J., F. Manghi, S.J. Cullen, P.M. Kaiser, 2009. Quantification of Nitrogen Removal under Recycled Water Recharge Ponds. Invited presentation to California 09 Section Conference of the WaterReuse Association, March 22-24, 2009, Intercontinental Mark Hopkins Hotel, San Francisco, California.
- Cullen, S. J., Todd G. Umstot, and Daniel B. Stephens, 2009. Parameter Estimation or Measurement for Vapor Transport Modeling? Invited presentation to The 19th Annual AEHS Meeting and West Coast Conference on Soils, Sediments, and Water, March 9-12, 2009 Mission Valley Marriott, San Diego, California.
- Cullen, S.J., J. Kelsey, N. Blandford, D. Reaber, 2007. Principal Workshop Developer and Instructor, Vadose Zone Hydrology: Principles and Practices, two day workshop co-sponsored by Wyoming Department of Environmental Quality, Sheridan, Wyoming, October 25-26, 2007.



- Sahu, R., Cullen, S.J., M. Jones, D. Reaber, 2007. Development of a Conceptual Site Model of Chemical Migration in Groundwater Adjacent to the Las Vegas Wash, Bringing Water To The Desert, Spring Conference, American Water Works Association, April 19, 2007, Las Vegas, Nevada.
- Cullen, S.J., R. Sahu, M. Jones, D. Reaber, 2006. Invited speaker, Investigating Paleochannel Occurrence Near The Las Vegas Wash, High Resolution Site Characterization & Monitoring, California Groundwater Resources Association, November 14, 2006, Long Beach, CA
- Cullen, S.J., R. Sahu, M. Jones, D. Reaber, 2006. Invited speaker, An Investigation of Perchlorate Impacts to Groundwater in the Las Vegas Vicinity, 2006 Water Quality / Regulatory Conference, East Valley Water District, October 26, 2006, Ontario, California.
- Cullen, S.J. 2005. Invited speaker, The Driving Force to Perchlorate Leaching: Application of Methods To Date Historic Meteoric Recharge Travel Time to Groundwater, "Environmental Forensics: Focus on Perchlorate", Workshop sponsored by the International Society of Environmental Forensics, La Fonda on the Plaza, Santa Fe, New Mexico, September 21- 22, 2005
- Sahu, R., S. Cullen, and M. Jones. 2005. An Update on Remedial Investigations of the BMI Site Common Areas Properties, Henderson, Nevada, presented to the BMI and Vicinity - All Companies Meeting, May 24, 2005, Henderson, Nevada.
- Cullen, S.J. 2005. Invited speaker, Theory and Application of Vadose Zone Instrumentation, The Santa Barbara Groundwater and Vadose Zone Instrumentation Workshop, Soilmoisture Equipment Corp., May 17, 2005, Goleta, California.
- Cullen, S.J. 2005. Invited speaker, Commercial Applications of Laboratory and Field Groundwater and Vadose Zone Instrumentation, The Santa Barbara Groundwater and Vadose Zone Instrumentation Workshop, Soilmoisture Equipment Corp., May 17, 2005, Goleta, California.
- Cullen, S.J. 2005. Invited speaker, Theory and Application of the Guelph Permeameter, The Santa Barbara Groundwater and Vadose Zone Instrumentation Workshop, Soilmoisture Equipment Corp., May 17, 2005, Goleta, California.
- Cullen, S.J. 2005. Invited speaker, The Importance of Environmental Protection of Soil and Groundwater Worldwide, The Santa Barbara Groundwater and Vadose Zone Instrumentation Workshop, Soilmoisture Equipment Corp., May 16, 2005, Goleta, California.
- Cullen, S.J., W. Allmon, and T. Battey. 2005. An Evaluation of Baseline Recharge Conditions at a Perchlorate-Impacted Site in an Arid Environment, a technical poster presentation to the California Groundwater Resources Association meeting, "Artificial Recharge: Nexus of Quantity and Quality in California", March 16-17, 2005, Sacramento, California.
- Cullen, S.J. 2004. Fate and Transport of Perchlorate in the Subsurface. Invited presentation to the American Chemical Society, Annual Meeting, March 31, 2004, Anaheim, California.



- Cullen, S.J. 2002. Dry Cleaners: Characterizing and Remediating Multiple Sources of PCE in a Complex Hydrogeologic and Legal Environment. Invited presentation to Entech West 2002, November 12, 2002, Long Beach, California.
- Cullen, S.J. and M. Lupo, 2001. Soil Bioventilation and Modeling of Air Flow. In American Microbiological Society (eds.), Manual of Environmental Microbiology, 2nd Edition, American Microbiological Society Press, Washington, D.C.
- McNab, W.W., Jr., B.P. Dooher, D.W. Rice, S.J. Cullen, L.G. Everett, M.C. Kavanaugh, W.E. Kastenburg, M.C. Small, and P.C. Johnson. 1998. Risk-Based Assessment of Appropriate Fuel Hydrocarbon Cleanup Strategies for the Base Exchange Service Station at Vandenberg Air Force Base, California. Report submitted to the Air Force Center for Environmental Excellence, Environmental Restoration Directorate, Technology Transfer Division, Brooks Air Force Base, Texas. Lawrence Livermore National Laboratory, Livermore, CA.
- Everett, L.G., S.J. Cullen, D.W. Rice, W.W. McNab, Jr., B.P. Dooher, M.C. Kavanaugh, P.C. Johnson, W.E. Kastenburg, and M.C. Small. 1998. Risk-Based Assessment of Appropriate Fuel Hydrocarbon Cleanup Strategies for the Naval Exchange Gasoline Station, Naval Construction Battalion Center, Port Hueneme, California. Submitted to the Naval Facilities Engineering Services Center, Port Hueneme, CA. Lawrence Livermore National Laboratory, Livermore, CA.
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