



CITY OF LODI

COUNCIL COMMUNICATION

AGENDA TITLE: Proposed Retention of Engineering Firm for Scoping Study of
PCE & TCE Contamination/Remediation

MEETING DATE: October 19, 1994

PREPARED BY: City Attorney

RECOMMENDED ACTION: Council approval of retaining Kennedy-Jenks
Engineering firm for PCE & TCE Scoping Study.

BACKGROUND INFORMATION: This matter was originally on the October 5, 1994
Council meeting agenda for action but was pulled
because of additional information which was needed
from the California Environmental Protection Agency (CALEPA). The City staff
continues to work with CALEPA as well as representatives of Busy Bee Cleaners,
Guild Cleaners and Lustre Cal to address certain previously identified PCE &
TCE contamination in the downtown area. Studies and monitoring have already
been conducted by URS Engineering on the nature and extent of the
contamination, but we should now determine the appropriate type and location of
remediation measures. That would be the task performed by Kennedy-Jenks.

We have known for several weeks that CALEPA intended to issue "Cleanup" Orders
to all parties, but gave the City and suspected sources of PCE & TCE
contamination a short time to explore the possibility of a joint effort.
However, if we do not act promptly, CALEPA has indicated it is prepared to go
forward with the administrative cleanup orders. That would place all parties
in adversarial positions and would probably generate litigation. We have been
working hard to avoid that and staff feels the situation might be better
addressed if all parties can work cooperatively.

In order to do that, information is needed on the method, location and
estimated costs of cleanup efforts so that some sort of cost sharing agreement
might be drafted. That is what the Kennedy-Jenks study would provide.

Ordinarily, an RFP would have been prepared for such a project. However,
because of the short time given to us by CALEPA, four potential firms were
contacted for verbal or written estimates. Kennedy-Jenks is recommended on the
basis of cost, expertise, expedience and familiarity with PCE & TCE
contamination issues.

APPROVED _____

THOMAS A. PETERSON
City Manager



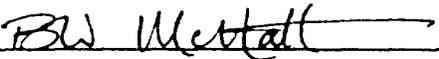
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Staff has been promised by Guild Cleaners and Lustre Cal that those firms will reimburse the City for their pro rata shares of the total Kennedy-Jenks costs. Busy Bee Cleaners has indicated it needs to explore its insurance coverage further before committing to pay for a share. Staff believes the City would in the near future need such information in any event, with or without the cooperation of Busy Bee, Guild or Lustre Cal. Even if no joint cleanup effort proves feasible, the study would be helpful to the City to better decide to resist the cleanup order or simply comply with CALEPA's direction.

At a meeting with CALEPA representatives on October 6, 1994, it was suggested by CALEPA that their preference might be that the City and the involved businesses undertake further study of the problem before beginning a remediation program. However, for numerous reasons, it appears in the City's best interest to go ahead with the Kennedy-Jenks study in order to begin timely measures to assure that the City continues to provide clean water to City residents.

FUNDING: Sewer Utility Fund or Sewer Reserve Fund

Respectfully submitted,



Bob McNatt
City Attorney

BM:pn



CITY OF LODI

COUNCIL COMMUNICATION

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MEETING DATE: October 19, 1994

PREPARED BY: City Attorney

RECOMMENDED ACTION: Council approval of retaining Kennedy-Jenks Engineering firm for PCE & TCE Scoping Study.

BACKGROUND INFORMATION: This matter was originally on the October 5, 1994 Council meeting agenda for action but was pulled because of additional information which was needed from the California Environmental Protection Agency (CALEPA). The City staff continues to work with CALEPA as well as representatives of Busy Bee Cleaners, Guild Cleaners and Lustre Cal to address certain previously identified PCE & TCE contamination in the downtown area. Studies and monitoring have already been conducted by URS Engineering on the nature and extent of the contamination, but we should now determine the appropriate type and location of remediation measures. That would be the task performed by Kennedy-Jenks.

We have known for several weeks that CALEPA intended to issue "Cleanup" Orders to all parties, but gave the City and suspected sources of PCE & TCE contamination a short time to explore the possibility of a joint effort. However, if we do not act promptly, CALEPA has indicated it is prepared to go forward with the administrative cleanup orders. That would place all parties in adversarial positions and would probably generate litigation. We have been working hard to avoid that and staff feels the situation might be better addressed if all parties can work cooperatively.

In order to do that, information is needed on the method, location and estimated costs of cleanup efforts so that some sort of cost sharing agreement might be drafted. That is what the Kennedy-Jenks study would provide.

Ordinarily, an RFP would have been prepared for such a project. However, because of the short time given to us by CALEPA, four potential firms were contacted for verbal or written estimates. Kennedy-Jenks is recommended on the basis of cost, expertise, expedience and familiarity with PCE & TCE contamination issues. Cost of the engineering services will not exceed \$16,000.00.

APPROVED: _____

THOMAS A. PETERSON
City Manager



Staff has been promised by Guild Cleaners and Lustre Cal that those firms will reimburse the City for their pro rata shares of the total Kennedy-Jenks costs. Busy Bee Cleaners has indicated it needs to explore its insurance coverage further before committing to pay for a share. Staff believes the City would in the near future need such information in any event, with or without the cooperation of Busy Bee, Guild or Lustre Cal. Even if no joint cleanup effort proves feasible, the study would be helpful to the City to better decide to resist the cleanup order or simply comply with CALEPA's direction.

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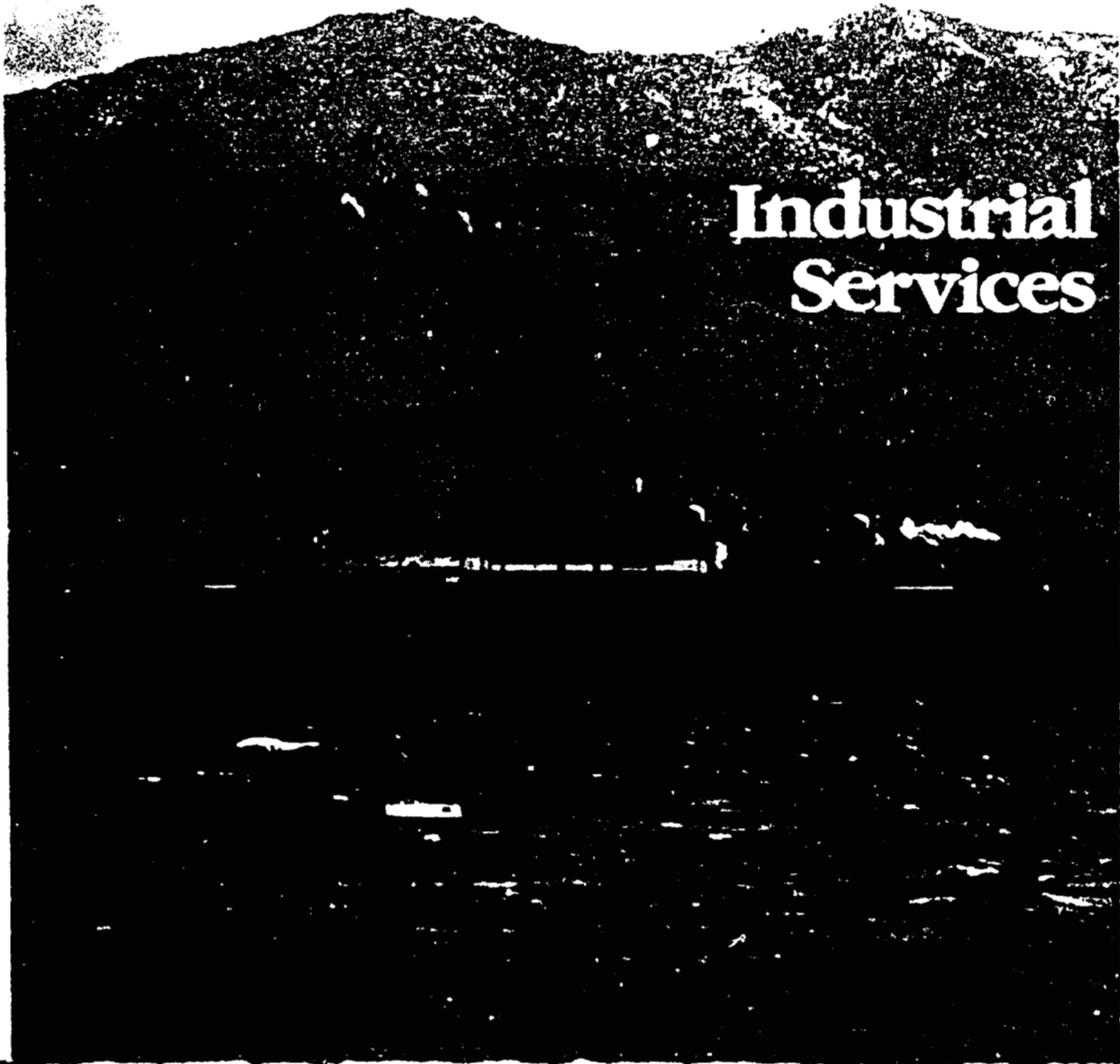
Respectfully submitted,



Bob McNatt
City Attorney

BM:pn

Kennedy/Jenks Consultants



**Industrial
Services**

Engineers & Scientists

Kennedy/Jenks Consultants

Engineers and Scientists

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916-362-3251
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20 September 1994

Mr. Fran E. Forkas
Water/Wastewater Superintendent
Public Works Department
City of Lodi
1331 South Ham Lane
Lodi, California 95242-3995

Subject: Statement of Qualifications
Proposal for Environmental Consulting Services
City of Lodi Groundwater Investigation
K/J 94-118-SAC

Dear Mr. Forkas:

Kennedy/Jenks Consultants (Kennedy/Jenks) is pleased to present our Statement of Qualifications for consulting services to assist the City of Lodi (the City) in evaluating options for proceeding with remedial investigations and/or remediation of the Lodi Groundwater Site. As requested in our meeting on 13 September 1994, we have also prepared a Proposal based on our discussions and understanding that the City would like to take a proactive position in addressing the project direction.

Kennedy/Jenks is comprised of two basic divisions; Industrial Services and Municipal Services, each complementing the other. The original group, Municipal Services, is well known for the design and development of water and wastewater treatment processes within the western United States. Industrial Services, established in the 1980's, extended our water and wastewater expertise to the treatment of hazardous wastes. Because of our long history in water development and treatment, Kennedy/Jenks soon became a leader in soil and groundwater site investigations, plume characterizations, design, construction and operation of remedial systems for all types of hazardous wastes.

Provided below are specific reasons why Kennedy/Jenks is uniquely qualified to support the City of Lodi on this project. Our attached Statement of Qualifications provides an overview of Kennedy/Jenks Consultant's general experience related to environmental consulting services.

PROJECT UNDERSTANDING

The Department of Toxic Substances (DTSC) has identified the presence of PCE, TCE, 1,1,1-Trichloroethane (1,1,1-TCA), and other Volatile Organic Compounds (VOCs) in soil and groundwater in the City of Lodi. The presence of these chemicals in soil and groundwater has been associated with operations of two dry cleaners and an industrial source; in addition, the

Mr. Fran E. Forkas
20 September 1994
Page 2

City may also be implicated due to possible leakage of chemicals in wastes disposed to the sewer system.

We understand that the City of Lodi seeks an experienced environmental consulting firm with the expertise to: 1) evaluate investigation reports, prepared for the California Environmental Protection Agency, Department of Toxic Substances (DTSC), addressing the Lodi Groundwater Site, and 2) provide the City with recommendations for responding to the DTSC. The objectives of our evaluation will be to assess whether further investigation is necessary and to evaluate whether the existing database is adequate for proceeding with remedial action planning and implementation.

Kennedy/Jenks is often requested to provide consulting services on work performed by other consultants or regulatory agencies. Frequently performed services include detailed review of reports prepared as a result of investigation and cleanup activities, oversight during investigation and remediation projects to document field procedures used, and field verification sampling and chemical analysis support. In performing these activities, Kennedy/Jenks is committed to serving as a strong advocate of the client's interests and needs. Kennedy/Jenks is sensitive to the clients' requirements for attention to detail, careful documentation, and confidentiality.

TECHNICAL APPROACH

Kennedy/Jenks can provide the City of Lodi with environmental support services in a timely and responsive manner. We will be an advocate for the City and provide input throughout the project. Our project approach is based on our understanding of the project and the City's objective to proactively address the VOCs in soil and groundwater. Our approach for completing the project includes the following elements. A detailed cost estimate to complete this Scope of Work is presented in Attachment A.

- Kennedy/Jenks will review the Phase I Remedial Investigation Report, Lodi Groundwater Site, dated June 1994 and prepared by URS Consultants, Inc. for DTSC. As part of our evaluation, we also propose to review previous investigation reports addressing DBCP in the City's groundwater which may be useful for understanding hydrogeologic conditions of the areas of concern and provide supplemental data applicable to the VOC contaminant plume.
- If the existing database is adequate for remedial action planning, we understand that the City is interested in evaluating remedial alternatives and their costs, including remediation of soil hot spots and extraction and treatment of groundwater to mitigate migration of the contaminant plume.
- Based on our evaluation, we will assist the City in developing a strategy for responding to the anticipated DTSC Order and provide recommendations for future direction of the project.

Mr. Fran E. Forkas
20 September 1994
Page 3

RELEVANT EXPERIENCE

Kennedy/Jenks has extensive experience ranging from project conceptualization through field investigations, data review and verification, risk assessments, focused feasibility studies, design and implementation of innovative and cost-effective solutions, and litigation support services. A description of relevant projects is provided below. Other examples of relevant projects are highlighted in Attachment B, Project Sheets.

Evaluation of Chlorinated Solvent Plume in Groundwater and Litigation Support Confidential Client San Joaquin County, California

Since July 1987, Kennedy/Jenks Consultants has investigated the sources of chlorinated solvents, the potential distribution of separate phases of chlorinated solvents, and the distribution of the chlorinated solvents in groundwater at a major shopping center in San Joaquin County. During the investigations, 15 wells ranging in depth from 80 to 300 feet were installed. The purpose of the investigation was to evaluate the impact of the solvents released from dry cleaners on public groundwater water supplies in the area.

Kennedy/Jenks Consultants was retained by our client to assist their attorney in technical and strategic matters related to litigation. Initially, our role involved the technical investigation of perchlorethylene and other solvent releases to soil and groundwaters from tenant dry cleaners. We have also provided litigation support and expert witness services, and served as Plaintiff's agent to oversee Defendant's investigation and remediation of the chemical releases. We assisted Counsel in winning a Motion for Summary Judgment on several precedent-setting RCRA rulings, and the allied CERCLA claims in Federal District Court. Sophisticated numerical computer models were used to forecast plume movement and chemical fate and mobility in order to establish probable effects of selected groundwater remediation scenarios. A "retrospective evaluation" was conducted of chemical releases which may have taken place in order to pinpoint potentially responsible parties and which insurance coverage to effect.

Problem Assessment Report City of Davis Davis, California

Kennedy/Jenks is in the process of conducting a Problem Assessment Report (PAR) investigation within the downtown area of Davis, California. The PAR investigation is being conducted in accordance with Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites. The subsurface soils and underlying groundwater are known to be impacted with petroleum hydrocarbons released from an underground storage tank and chlorinated solvents, including PCE and TCE, released from a nearby dry cleaning facility. The purpose of the PAR investigation is to define the vertical and

Mr. Fran E. Forkas
20 September 1994
Page 4

lateral extent of each plume and to collect data on the aquifer characteristics to aid in remedial action planning.

As the problem area is a fully developed mix of private residences and commercial establishments, remedial action planning is focusing on insitu techniques for cleaning up both the soils and the groundwater. Massive excavation and other intrusive remedial actions would be damaging to local business operations, traffic and the lives of people living within the area. Insitu techniques such as formation aeration, soil venting, biodegradation and traditional pump and treat methods are being considered. Prior to selecting one or more of these technologies, a field pilot-study will be conducted to assess the technologies feasibility and to collect engineering data to allow design of a full-scale remediation system. Design of full-scale remedial systems are scheduled to be completed by Spring 1995 with installation to follow upon approval by the Regional Water Quality Control Board. Kennedy/Jenks Consultants is designing the remedial systems to be incorporated into the planned redevelopment of that area of Davis.

In addition to assisting the City of Davis with the PAR investigation and remedial planning, Kennedy/Jenks Consultants is conducting a quarterly groundwater monitoring program in the area. The purpose of the quarterly groundwater monitoring program is to maintain and update the existing database on groundwater quality and gradient underlying the area. Each quarter the groundwater elevations and samples are collected from each of the monitoring wells. The results of the sampling are presented in reports prepared by Kennedy/Jenks and forwarded to the Regional Water Quality Control Board for review and comment.

**Groundwater Remedial Options Evaluation
Semiconductor Industry
Confidential Client
San Jose, California**

Kennedy/Jenks Consultants conducted a comprehensive groundwater supply, protection and restoration study for this client as well as a risk assessment. As part of this project, we have evaluated alternative methods to remediate groundwater containing volatile organic chemicals (VOCs), including TCA, TCE, and other non-chlorinated organics. Cost estimates have been prepared for air stripping and granular activated carbon (GAC) adsorption to compare these methods. Also, as part of the interim remedial measures, we have designed and managed construction of several high-capacity water extraction wells with conveyance and control systems, onsite and offsite, and a GAC water treatment system onsite. Laboratory treatability studies have been performed to evaluate GAC and other groundwater treatment alternatives.

**Groundwater Investigation and Remedial Action
Solvent Recovery Firm
Confidential Client
Los Angeles, California**

Kennedy/Jenks performed a groundwater contamination assessment and developed a remedial action plan for a solvent recovery firm in Los Angeles County. This project included the

Mr. Fran E. Forkas
20 September 1994
Page 5

investigation of the vertical and lateral extent of soil and groundwater contamination. The major volatile organic chemicals (VOCs) of concern include TCA, TCE, PCE, methylene chloride, and Freon-113. Several groundwater monitoring wells were installed, lithologically and geophysically logged, tested to estimate hydraulic conductivity, and sampled for purgeable halocarbons and aromatics. Local groundwater gradient, direction, and velocity were estimated to aid in plume definition. An interim groundwater extraction well was designed and installed onsite while the groundwater investigation continued.

Remedial action plan development included (1) evaluation of excavation and/or containment of contaminated soil and (2) cost-effectiveness analysis of groundwater extraction and treatment alternatives. Based on results of a pilot study, an air stripping system for treatment of groundwater from additional extraction wells was designed. The air stripping system included gas phase granular activated carbon adsorption for exhaust gas treatment.

Kennedy/Jenks has prepared construction plans and specifications for soil excavation and well pumps, conveyance, and groundwater treatment facilities; assisted with contractor selection; and provided construction review services. A pilot study is currently being implemented to investigate soil venting to remove residual VOCs from unsaturated soils.

**Remedial Investigation/Feasibility Study,
Remedial Action Plan, Remedial Design and Implementation
Instrument Manufacturer - Confidential Client
Western Nevada**

Kennedy/Jenks Consultants conducted a phased Remedial Investigation/Feasibility Study (RI/FS) and prepared a Remedial Action Plan (RAP) on behalf of an instrument manufacturer for submittal to the Nevada Division of Environmental Protection (NDEP). The investigation of volatile organic compounds (VOCs) in soil and groundwater was completed and the RAP approved by NDEP. The selected remedial technology (groundwater extraction and treatment by air stripping) has been implemented and is successfully containing the migration of VOCs and reducing the concentrations of VOCs in groundwater in the vicinity of and downgradient of the site.

The investigation of VOC distribution and migration included soil gas surveys, source soil collection and evaluation, reconnaissance groundwater sampling, monitoring well installation and sampling, aquifer testing and solute transport modeling.

Kennedy/Jenks Consultants, working with the client's construction management staff, designed, permitted, installed and tested four groundwater treatment systems. The groundwater, which is extracted from two aquifers using ten extraction wells, is treated by air stripping in countercurrent towers. This cooperation and coordination with the client resulted in a significant reduction in construction, start-up, operation and maintenance costs.

Groundwater modeling was performed to predict VOC concentrations in a downgradient surface water body to support a risk-based proposal to limit the extent of groundwater remediation.

Mr. Fran E. Forkas
20 September 1994
Page 6

The RAP was prepared on the basis of the RI. The primary purpose of the RAP was to develop and evaluate remedial action alternatives for selection of a recommended remedial action. Each alternative was evaluated according to technical, public health/environmental, institutional and cost effectiveness criteria. The RAP was approved and the selected remedial alternative implemented. The RAP contained a plan for shut down of the remedial system that may allow for groundwater cleanup levels above the Federal Maximum Contaminant Levels (MCLs) for the VOCs of concern. The plan incorporated the Corrective Action criteria set forth in Nevada Administrative Code 459.9978. This criteria provides a mechanism for terminating groundwater cleanup based on the decline in chemical concentrations. Shut down prior to reaching MCLs will probably result in significant cost savings for the client.

PROJECT TEAM

Kennedy/Jenks has assembled an experienced project team to meet the technical and strategic needs of the project. The key project team members all have the expertise and relevant project experience to provide the City of Lodi with the necessary technical support through completion of the project. A brief description of the key team members and their role on the project are provided below. Resumes of project team members are included in the attached Statement of Qualifications.

Martha S. Knowlton, R.G. - Project Manager

Ms. Knowlton will serve as the primary liaison between the City of Lodi and Kennedy/Jenks and coordinate project team assignments. Ms. Knowlton is a California registered geologist and has extensive experience in managing remedial investigations, feasibility studies and remedial actions. She has provided technical support on subsurface characterization of a shopping center site in northern California where PCE and TCE were discharged into groundwater by dry cleaner facilities. Ms. Knowlton is the project manager of a RCRA Facility Investigation and Corrective Measure Study for a former industrial facility in California. She was also the project manager for the investigation and remediation of two sites at a Sacramento industrial facility named on the California Superfund list.

James G. Curtis, P.E. - Remedial Action Manager

Mr. Curtis will assist Ms. Knowlton in evaluating remedial alternatives for the City of Lodi and preparation of cost estimates. He has extensive experience on a variety of site remediation projects. His project experience ranges from subsurface investigations of soil and groundwater to selection of remediation alternatives, design and permitting, installation, construction, operation, and maintenance of remediation systems. Mr. Curtis is the project manager for the City of Davis PAR investigation and remediation project.

Anne M. Farr - Technical Advisor

To augment Kennedy/Jenks' project team, we will contract the services of Dr. Anne Farr, a hydrogeologist experienced in subsurface investigations of VOCs. Dr. Farr, formerly of Kennedy/Jenks, is currently providing consulting services on projects involving the fate and

Kennedy/Jenks Consultants

ATTACHMENT A

Project Scope and Budget

**Proposed Scope of Work
Lodi Groundwater Site
City of Lodi
K/J 94-118-SAC**

Provided below is a proposed Scope of Work to assist the City of Lodi in evaluating existing data concerning the Lodi Groundwater Site and providing cost estimates for remedial action. Our proposed scope of work is based on our meeting with the City on 13 September 1994.

Task 1 - Review Lodi Groundwater Site Reports

Kennedy/Jenks will review the Phase I Remedial Investigation Report, Lodi Groundwater Site, dated June 1994 and prepared by URS Consultants, Inc. for DTSC. The purpose of our review will be to assess whether Report data adequately characterizes the Site for remediation of the contamination plume(s) and source areas; if the data does not adequately characterize the Site, we will identify the additional work necessary to proceed with remedial action. As discussed with the City of Lodi, hydrogeologic data useful to our characterization of the Lodi Groundwater Site may be available in other reports prepared for the City concerning the DBCP groundwater contamination in Lodi. If available, Kennedy/Jenks will also review these reports to obtain additional data to assist us in our evaluation and characterization of the Lodi Groundwater Site.

Task 2 - Prepare Remedial Options and Cost Estimates

If the data available in the Lodi Groundwater Report and DBCP reports is adequate to initiate remedial action planning, Kennedy/Jenks will develop remedial options and prepare cost estimates for the City of Lodi. During the development of these options, Kennedy/Jenks will discuss with the City their future water needs, project objectives and other requirements which may impact the selection and implementation of a remedial alternative. We understand that the City recognizes that our cost estimates will be based on information provided in the reports and can increase or decrease depending on pilot field test results, equipment changes, City requirements and unforeseen limitations at the site. It is our intent to provide cost estimates within 15 to 20 percent of final costs.

Task 3 - Preparation of Report

Kennedy/Jenks will prepare a brief letter report summarizing our evaluation and opinion as to the adequacy of the data for developing a remedial action plan for the Lodi Groundwater Site. If we believe that there is insufficient data to proceed with remedial action planning, we will provide a scope of work for additional investigation at the site and a cost estimate to obtain the necessary data to further characterize the Site. If we deem that the data is adequate to characterize the site hydrogeology and contamination plume(s), we will discuss various remedial options and their associated costs.

Task 4 - Project Management and Meeting

For cost estimating purposes, we have assumed that Ms. Knowlton and Mr. Curtis will have one meeting with the City of Lodi and other interested parties to discuss the Lodi Groundwater Site. Discussion topics may include the results of our evaluation of available data, potential

Kennedy/Jenks Consultants

plans of action for remediating the Site, the City's needs and objections, and possible responses to the DTSC potential Order. This task includes budget for project administration and coordination.

Inasmuch as the exact level of effort to complete this proposed Scope of Work cannot be identified at this time, Kennedy/Jenks proposes that completion of the above tasks be on a time and expense reimbursement basis in accordance with the attached Schedule of Charges dated 1 January 1994. Based on the Scope of Work described above, we propose a budget of \$15,500. This budget will not be exceeded without prior authorization from the City of Lodi. The approximate budget distribution is as follows:

Task 1 - Review Lodi Groundwater Site Reports	\$6,400
Task 2 - Prepare Remedial Options and Cost Estimates	\$5,600
Task 3 - Preparation of Report	\$2,300
Task 4 - Project Management and Meeting	<u>\$1,200</u>
Total Project Budget Estimate	\$15,500

PROJECT SCHEDULE

Kennedy/Jenks is prepared to initiate proposed Scope of Work upon receipt of authorization to proceed from the City of Lodi. At that time, we will discuss a schedule for completing our review of the reports and submittal of a letter report.

Client/Address: Mr. Fran E. Forkas
City of Lodi
1331 South Ham Lane
Lodi California 95242-3995

Contract/Proposal Date: September 21, 1994

Schedule of Charges

January 1, 1994

Personnel Compensation

Classification	Hourly Rate
Drafter/Technician	\$ 56
Designer/Senior Technician	69
Engineer-Scientist, Grade 3	68
Engineer-Scientist, Grade 2	85
Engineer-Scientist, Grade 1	101
Senior Engineer-Scientist	117
Supervising Engineer-Scientist	126
Principal/Consultant	133
Laboratory Analyst	55
Word Processor	47
Non-Technical*	37

*Non-technical time will be charged only for preparation of technical reports and similar material and does not apply to routine administrative-type activities.

The above Hourly Rates include normal and incidental costs such as routine copying, communications, postage and office supplies.

Direct Expenses

Reimbursement for direct expenses, as listed below, incurred in connection with the work, will be at cost plus ten percent for items such as:

- a. Maps, photographs, reproductions, printing, equipment rental, and special supplies related to the work.
- b. Consultants, soils engineers, surveyors, contractors, and other outside services.
- c. Rented vehicles, local public transportation and taxis, travel and subsistence.
- d. Specific telecommunications and delivery charges.
- e. Special fees, insurance, permits, and licenses applicable to the work.
- f. Outside computer processing, computation, and proprietary programs purchased for the work.

Reimbursement for owned automobiles, except trucks and four-wheel drive vehicles, used in connection with the work will be at the rate of 35¢ per mile. The rate for trucks and four-wheel drive vehicles will be \$25 per day and 40¢ per mile.

Reimbursement for use of microcomputers will be at the rate of \$10 per hour. Reimbursement for use of computerized drafting systems (CADD) will be at the rate of \$20 per hour for microcomputer based systems and \$25 per hour for minicomputer based systems.

Rate for professional staff for legal proceedings or as expert witnesses will be at a rate one and one-half times the Hourly Rates specified above.

In-house laboratory analysis, sampling vehicle, and equipment charges will be per current rate schedule or special quotation.

Excise and gross receipts taxes, if any, will be added as a direct expense.

Additional processing charges will be added for other than standard invoice backup documentation.

The foregoing Schedule of Charges is incorporated into the agreement for the services provided, effective January 1, 1994 through December 30, 1994. After December 30, 1994, invoices will reflect the Schedule of Charges currently in effect

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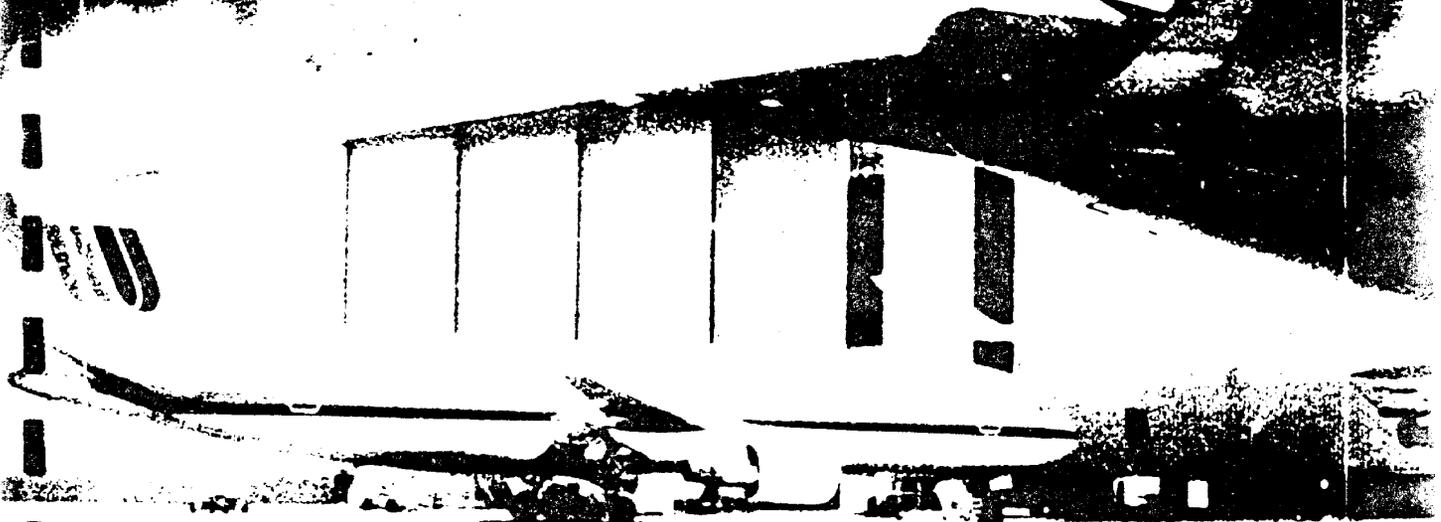
ATTACHMENT B

Selected Project Sheets

CASE STUDY

Metals Removal Plane and Simple

Wastewater



*Aircraft maintenance center
uses sulfide precipitation to
remove heavy metals from
wastewater, meet new
discharge limits*

By Daniel F. Seidel and Neil Denton

United Airlines operates a major aircraft maintenance center at San Francisco International Airport that provides depot-level overhaul services for the company's entire fleet of aircraft.

In an average year, the 40-year-old center services 1,200 aircraft and 1,500 turbine engines, performs 80 paint jobs and overhauls more than a million components. It employs more than 13,000 people and has a complete range of shops for engines, landing gear, tires and brakes, metal plating, machining, airframe repair, instruments, electronics and interior work.

United Airline's maintenance center at San Francisco International Airport provides depot-level overhaul services for the company's entire fleet of aircraft.

COURTESY OF REMEDIATION CONSULTANTS

Kennedy/Jenks Consultants Office Locations

San Francisco

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FAX 805 831 5196

Irvine

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Irvine, California 92714
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FAX 714 261 2134

Palo Alto

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FAX 415 856 8527

Sacramento

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FAX 916 362 9915

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San Diego, California 92127
619 675 7411
FAX 714 261 2134

Ventura

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Ventura, California 93003
805 658 0607
FAX 805 650 1522

Carson City

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Carson City, Nevada 89701
702 887 7450
FAX 702 887 7457

Reno

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Reno, Nevada 89502
702 827 7900
FAX 702 827 7925

Federal Way

530 South 336th Street
Federal Way, Washington 98003
206 874 0555
FAX 206 952 3435

Las Vegas

1455 E. Tropicana Avenue, Suite 300
Las Vegas, Nevada 89119
702 795 3960
FAX 702 795 3964

Portland

317 SW Alder, Suite 1125
Portland, Oregon 97204
503 223 0299
FAX 503 223 0316

Pacific Environmental Laboratory

674 Harrison Street
San Francisco, California 94107
415 243 2580
FAX 415 896 0999

Industrial wastewater from the center, which sits on 147 acres adjacent to San Francisco Bay, is pretreated to remove oil and suspended solids before being discharged to the airport's industrial wastewater treatment plant (WWTP).

The airport WWTP, however, cannot treat heavy metals, so when the state lowered the site's heavy metal discharge limits in 1987, the maintenance center was required to upgrade its pretreatment processes.

At the time, copper, lead, cadmium and nickel were the center's principal concerns, although chromium, phenol, cyanide and detergents also were factors. More recently, toxicity to fish and other aquatic organisms has become an issue.

To address these concerns, the maintenance center decided to minimize waste, isolate wastestreams and improve pretreatment processes. Specifically, the strategy included:

- eliminating cyanide stripping solution wherever possible,
- batch treating and recovering metals from spent plating solutions,
- reducing chromium and hydroxide precipitation,
- batch treating phenol and metal-bearing paint-stripping wastes, and
- reducing the frequency of aircraft washing.

At the same time, the center also focused on reducing atmospheric emissions of volatile organic compounds (VOCs), primarily from solvents. However, reducing the number of solvent-based cleaners increased the use of water and detergents, which resulted in greater loading on the wastewater treatment system. The center also installed a 0.6 million-gallon stormwater retention basin to intercept the first half inch of runoff from the aircraft parking areas and washrack. Collected runoff is routed to the oil-water separation plant.

The center began addressing end-of-pipe treatment needs in 1988 by performing source monitoring and characterization studies to identify major pollutants and their sources. (This information also was used for

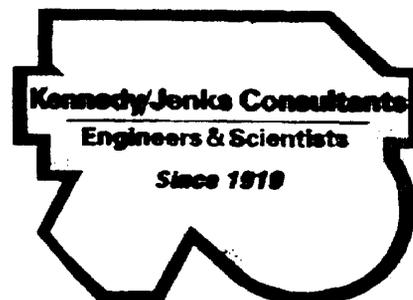
Reducing the number of solvent-based cleaners increased the use of water and detergents, which resulted in greater loading on the wastewater treatment system.

waste minimization planning.)

These sources included all major sumps and wet wells in the industrial sewer system, the aircraft washrack, stormwater holding basin, plating shop sumps and the paint-stripping wastewater treatment unit.

Analyses were performed for heavy metals, oil and grease, suspended solids, pH, phenol, cyanide and detergents. (Table 1 shows the maximum daily concentration allowed for each constituent, the number of samples exceeding the standard, and the range and average values of those constituents.) Average dry-weather flow is 300 gallons per minute (gpm), with a peak wet-weather factor of two.

The key heavy metals were cadmium, chromium, copper, lead and nickel. Oil and grease were not a problem, although the existing oil-water separator eventually



was replaced with a larger unit.

Besides laboratory and bench-scale treatability tests, subsequent studies involved testing specific equipment to identify processes that would meet the discharge limits.

A screening process eventually led the project team to select iron sulfide precipitation to precipitate or coprecipitate heavy metals.

Hydroxide precipitation could not meet the limits for cadmium, chromium or nickel. Membrane and ion-exchange processes also were rejected because they required extensive pre-conditioning and were not cost-competitive.

Process development. Bench-scale studies verified that sulfide would precipitate the metals, but using flocculation and sedimentation to remove fine precipitate posed a significant problem. Inorganic coagulants and various cationic, anionic and nonionic polymers were tested until a cationic/anionic combination was found that worked.

A one-month pilot test using a solids contact reactor/clarifier unit was performed to evaluate process performance and obtain on-line design data. The unit was rated at 100 gpm for

water treatment applications but could handle only 50 gpm for sulfide precipitation because of the light floc that formed.

Four problems were identified during pilot tests:

- uncontrolled discharge of batch-treated paint-stripping water, which contained high concentrations of heavy metals and phenol, caused process upsets;
- wastewater temperature variations caused thermal stratification and short-circuited treatment units;
- flow and waste variability interfered with consistent performance; and
- nickel was the critical heavy metal, even when everything was working well.

After investigating these problems, the project team concluded that the treatment process for paint-stripping wastewater required better control, equalization was needed to overcome composition and temperature variations, and nickel would be a continuing problem. It also decided to place the filter units ahead of the carbon contactors to minimize plugging.

Team members then visited two comparably sized industrial WWTPs that use sulfide precipitation processes. These

TABLE 1
Oil Separation Plant Effluent

Constituent	New Standard Daily Maximum Concentration (mg/l)	Number of Samples Exceeding Standard ¹	Statistics for Samples Exceeding Standards	
			Range (mg/l)	Average (mg/l)
Metals				
Arsenic	0.20	0	—	—
Cadmium	0.03	26	0.04-0.17	0.078
Chromium	0.11	27	0.13-0.80	0.32
Copper	0.20	7	0.22-0.33	0.26
Lead	0.056	10	0.06-0.48	0.19
Mercury	0.001	0	—	—
Nickel	0.071	28	0.12-0.77	0.32
Silver	0.023	0	—	—
Zinc	0.58	0	—	—
Nonmetals				
Cyanide	0.1 average	4	0.26-1.79	0.77
(Total)	0.2 maximum			
MBAS ³	4.5	28	5.0-34.6	13.9
pH (unit)	5 to 9	1	10.9	10.9
Phenol	1.5	7	1.7-6.2	3.7
Oil & Grease	120	0	—	—
Settleable Matter	0.5	0	—	—

Notes:

¹ Semimonthly 24-hour composite samples, from December 1986 through January 1988. Number of analyses is 28.

² Caused by spill.

³ MBAS: Methylene blue active substance, anionic surfactants that react with methylene blue to form a blue chloroform-soluble complex; the intensity of color is proportional to concentration.



COURTESY OF REMEDIATION CONSULTANTS

The new metals removal plant, shown here near the end of construction, began operating in 1992.

visits confirmed both the viability of sulfide precipitation and the value of flow equalization.

The culmination of this testing and research effort is a system that includes screening, flow equalization, dissolved air flotation, and heavy metals precipitation using ferrous sulfide in a reactor/clarifier. The plant has a nominal operating capacity of 300 gpm, with a peak hydraulic capacity of 700 gpm.

Effluent is filtered through an 'racite coal and partially treated with granular activated carbon (GAC). Oily sludge is dewatered in a rotary drum vacuum filter and incinerated; sulfide sludge is dewatered in a filter press; and metal sludge is disposed in a Class I landfill or hauled to a smelter for metals recovery.

Pilot tests and the original system design were based on a process developed for and patented by the U.S. Air Force, but high royalty charges for a process license led the project team to select a similar but less costly alternative.

Specifically, the team was interested in the sulfide precipitation stage of Permutit's Sulfex process, in which ferrous sulfide is injected into the wastestream along with cationic and anionic polymers to precipitate, flocculate and settle out heavy metals. (The first stage of the process — hydroxide

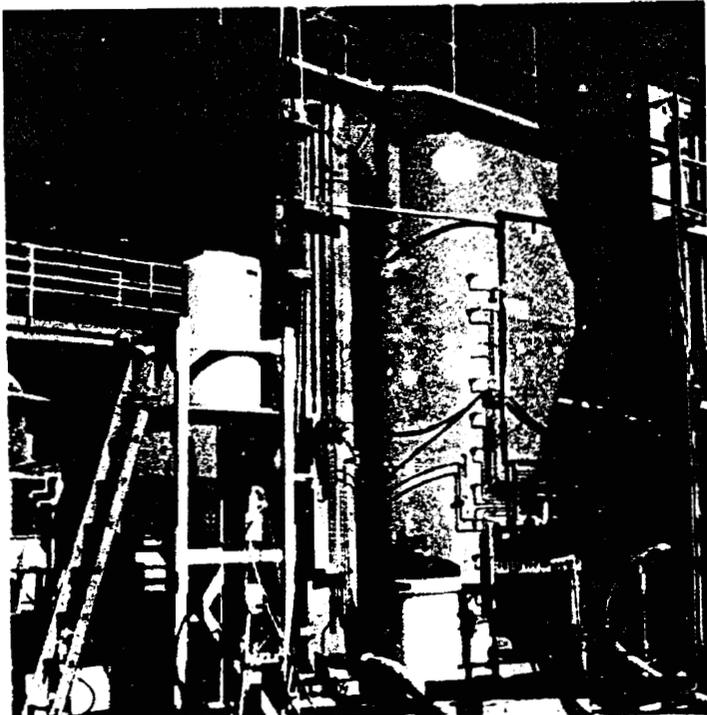
TABLE 2
San Francisco Metals Removal Plant Performance Summary

Constituent	Permitted Daily Maximum Concentration (mg/L)	Influent		Effluent	
		Range (mg/L)	Average (mg/L)	Range (mg/L)	Average (mg/L)
Metals					
Arsenic	0.20	0 - 1.4	.07	0 - .02	.005
Cadmium	0.03	0.2 - 1.9	.24	0 - .04	.008
Chromium	0.11	.12 - 9.9	2.0	0 - .37	.065
Copper	0.20	.09 - 1.8	.54	0 - .08	.025
Lead	0.056	0 - .78	.18	0 - .13	.019
Mercury	0.001	0 - 0.001	0	0 - 0.001	0.0
Nickel	0.071	.05 - 3.1	.52	0 - .68	.11
Silver	0.023	0 - .12	.02	0 - .04	.005
Zinc	0.58	.08 - 2.2	.55	0 - .85	.12
Nonmetals					
Cyanide	0.1 ave./0.2 max.	.02 - 3.0	.31	.01 - 3.0	.12
MBAS*	4.5	2.2 - 46	14	.06 - 13	2.6
pH (unit)	5 to 9	2 - 13	8.9	6.4 - 11	8.8
Phenol	1.5	.19 - 10	1.5	.13 - 6.1	1.0
Oil & Grease	120	17 - 380	130	3 - 46	18
Settleable Matter	0.5	0 - 38	6.0	0 - .09	.02

Notes:

These data are based on semimonthly 24-hour composite samples taken from June 1992 through May 1993 (24 samples).

*MBAS: Methylene blue active substance, anionic surfactants that react with methylene blue to form a blue chloroform-soluble complex, the intensity of color is proportional to concentration.



COURTESY OF KENNEDY/JENKS CONSULTANTS

The pilot system featured a Densadeg metals precipitation unit manufactured by Infilco-Degremont (Richmond, Va.). The unit contains three compartments: a two-stage, back-mixed tank, a recirculating reactor containing a turbine mixer, and a clarifier/thickener with tube settlers.

precipitation—was ineffective on the wastewater's low initial metals concentrations.)

Typically, the sulfide precipitation stage occurs in a solids-blanket reactor/clarifier, but because of space restrictions, the maintenance center's process is a hybrid that uses the second stage of the Sulfex process with a modified equipment configuration and flow regime.

Instead of the Sulfex solids-blanket reactor/clarifier, the system features a Densadeg unit manufactured by Infilco-Degremont (Richmond, Va.). This metals precipitation unit is a three-compartment apparatus consisting of a two-stage, back-mixed tank, a recirculating reactor containing a turbine mixer, and a clarifier/thickener with tube settlers.

The plant is fully confined in a containment basin to protect against accidental spills. Instruments measure flow, pH, turbidity, sludge blanket level and streaming current. All process units are computer monitored and controlled, with dual programmable logic controllers and dual terminals. Special covers, vents and flame arresters were installed on the inlet works, equalization tanks, dissolved-air flotation unit and oily sludge storage tank to comply with new air emission regulations for VOCs.

Operating experience. After the first year of operation, several process changes were made:

- Ferrrous sulfide batching difficulties caused by chemical impurities were resolved with metered batching and the use of non-caking granular ferrous sulfate.
- GAC plugging caused by bioslime was reduced with periodic caustic soda treatment.
- Foaming caused by the wastewater's high detergent levels was reduced by better controlling washrack operations and adding water sprays at foam-producing locations.
- Toxicity of the undiluted effluent was reduced by switching to non-toxic detergents and cleaners.
- Nickel discharges in excess of treatment capability are being addressed by tighter material inventory control, source controls and reduced use of cyanide and other chelating agents.
- Process upsets from accidental spills in the main facility were addressed by improving communication among the center's various operating areas.

Efforts are continuing to improve plant performance, reduce chemicals costs and isolate sources of problem contaminants that can result

in process upset or cause the plant to exceed its discharge limits.

Overall process performance has been generally satisfactory (Table 2). Occasions when discharge limits have been exceeded typically involved a short period of time and were the result of an uncontrolled discharge in the center. The system reduces total heavy metal concentrations (nine metals) 91 percent, from 4.1 milligrams per liter to 0.36 milligrams per liter.

Initial characterization and treatability studies were performed in 1988, the first year of a five-year drought. As water conservation efforts were implemented, constituent concentrations increased, so when the treatment plant began operating in 1992, it received a more concentrated waste than anticipated.

During the winter of 1992-1993, an above-average rain thoroughly flushed accumulated solids from the collection system and greatly increased the mass loading on the plant. As a result of these changing conditions, operation of the facility has been a continuing challenge. As operation becomes a more predictable routine, performance should become more reliable and economical. ■

Daniel F. Seidel is a senior project manager with Kennedy/Jenks Consultants (San Francisco). Neil D. Brown is a staff engineer at the United Airlines Maintenance Operations Center at San Francisco International Airport.

Removing VOCs from Santa Monica's Groundwater

The Arcadia Water Treatment Plant - Santa Monica, California



some City wells. In the early 1990s MWD restricted imported water supplies due to drought.

Since the plant has a busy downtown location, however, the City wanted to minimize aesthetic and environmental impacts. The Arcadia Water Treatment Plant occupies a city block surrounded by tract homes, high-rise buildings, and heavy traffic, with a hospital and five schools within a 5,000 ft. radius of the plant.

The Solution

Kennedy/Jenks Consultants developed an innovative process design that not only met the City's aesthetic and environmental criteria but also allowed expanded groundwater use. Our design uses mechanical surface aeration (MSA) to remove VOCs instead of the more commonly used packed tower aeration (PTA) process. This is the first full-scale use of MSA to remove VOCs in a municipal water treatment plant. Air quality is protected because process emissions containing VOCs are collected and treated in vapor phase granular activated carbon units before release to the atmosphere.

We chose MSA because it offered the best means for resolving site limitations and aesthetic problems.

The Kennedy/Jenks design saved valuable space since the MSA process could be retrofitted into the plant's existing 5-million-gallon covered reservoir. By enclosing the MSA process, we also eliminated the noise and aesthetic impacts of the VOC process on nearby residents.

Benefits to the Community

Treatment and removal of VOCs in the groundwater has allowed the City to make greater use of its potential groundwater resources and reduce its reliance on expensive imported water. This reduces the costs for producing water and assures the City of a reliable water supply, especially during periods of drought. Most importantly, the expanded plant protects public health and safety by removing VOCs from drinking water and by collecting and treating process emissions before release to the air.



Since the plant utilizes local groundwater in place of imported water, the City qualified for funding under MWD's Groundwater Recovery Program. The project received the Consulting Engineers Association of California (CEAC) 1992 Award for Outstanding Engineering Achievement.

The City of Santa Monica had suffered through several years of drought and reduced water allotments, when it decided to reduce its dependence on expensive imported water by restoring its groundwater yield and expanding the treatment capabilities at the Arcadia Water Treatment Plant

Santa Monica uses a combination of local groundwater and imported surface water supplied by the Metropolitan Water District of Southern California (MWD). In the mid-1980s, groundwater supplies were cut when volatile organic compounds (VOCs) were discovered in

Investigation/Groundwater Remediation

Semiconductor Manufacturer - Santa Clara Valley, California

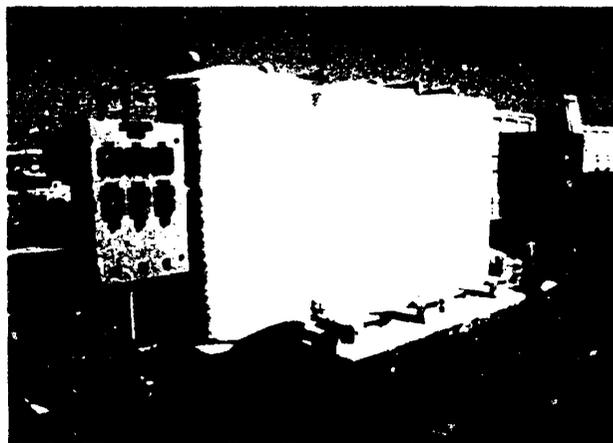
The Problem

In 1987 our client asked us to investigate a chemical spill on their property. The scope of the study was broadened in 1989 when the local Regional Water Quality Control Board (RWQCB) issued a site cleanup order requiring our client to investigate and remediate volatile organic compounds (VOCs) found at the plant site.

Our client, a major semiconductor manufacturer, had to characterize the vertical/lateral extent of contamination and determine concentrations of VOCs in soil and groundwater. They then needed to initiate interim remedial measures (IRMs) to design a system that would meet final cleanup levels, and implement a remedial system to achieve these levels.

The Solution

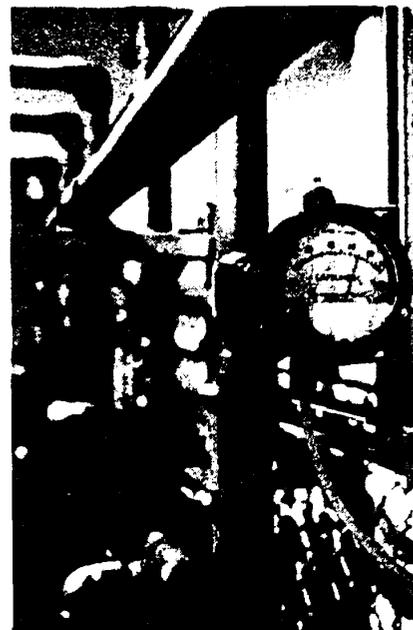
Kennedy/Jenks conducted a phased investigation of soil, groundwater, and soil gas to characterize VOCs at the site. Our investigation included soil borings to locate the chemical source area, and a soil gas survey to help define the extent of chemicals released from the site. We also designed, installed,



and sampled a groundwater monitoring network with 11 monitoring and extraction wells to complete the site characterization and plan for IRMs.

We then helped our client compare the relative cost and technical feasibility of various treatment options, eventually selecting liquid phase granular activated carbon (GAC). The treatment system that Kennedy/Jenks designed extracts groundwater from the subsurface and filters it through a series of GAC canisters. Treated effluent is then discharged to San Francisco Bay in accordance with a National Pollutant Discharge Elimination System (NPDES) permit.

To confirm that the system would operate as designed, we performed start-up testing. Our performance data show that the system creates a chemical capture zone that takes in nearly all areas where chemicals have been detected and that chemical concentrations are reduced to nondetectable levels after treatment.

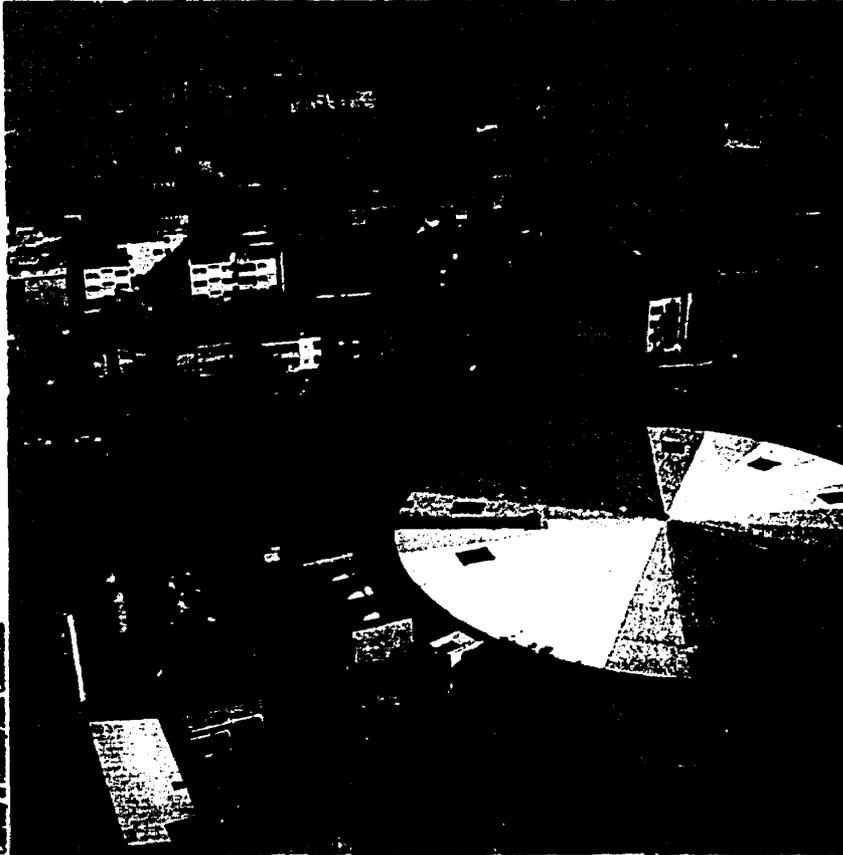


Client-Oriented Service

Client support is a very important component of our services. We helped our client apply for the NPDES permit required for disposal of treated effluent. We also expedited the cleanup and permitting process by maintaining liaison between our client and the regulatory agency.

Our continuing services include operational support for the treatment system, quarterly groundwater monitoring, assisting the client in complying with their NPDES permit and site cleanup order, and help in disposal of spent GAC. We have provided our client with a focused solution to a complex and potentially costly problem.

New Process Removes VOCs from Groundwater



Courtesy of Metropolitan Water District

The first known large-scale application of mechanical surface aeration (MSA) technology for removal of volatile organic compounds (VOCs) from groundwater used as a drinking water source has been installed in Santa Monica, Calif. The \$2.6-million plant retrofit at the Arcadia Water Treatment Plant in west Los Angeles has reduced the city's water production costs by allowing increased use of available groundwater resources while also meeting some very challenging site restrictions. The Arcadia plant received the Grand Award for Outstanding Engineering Achievement in the Consulting Engineers Association of California's 1992 Engineering Excellence competition.

The large-scale municipal use of MSA to remove VOCs is new.

Santa Monica's water supply is a combination of local groundwater and imported surface water from the Metropolitan Water District of Southern California (MWD). In the mid-1980s, local groundwater supplies were reduced when VOCs were discovered in some city wells. When the continuing drought restricted imported water supplies, Santa

Monica moved to restore its groundwater yield by expanding treatment capabilities at the Arcadia plant.

The plant is surrounded on all sides by residential housing, high-rise office buildings, and a constant stream of traffic. A hospital and five schools are also located within a 1520-m (5000-ft) radius of the plant. Because of the Arcadia plant's conspicuous mid-town location and the proximity of vulnerable populations, aesthetics and concern for public health played a dominant role in technology selection.

Selecting the Process

Of the commonly used processes for VOC removal, air stripping is generally the most cost effective. With this in mind, the city's engineering consultant evaluated two potential air stripping alternatives—packed tower aeration (PTA) and mechanical surface aeration (MSA).

While both PTA and MSA were found to be effective and reliable for the removal of VOCs, each approach offered different advantages. Because the MSA process could be retrofitted into the plant's existing $19 \times 10^3\text{-m}^3$ (5×10^6 -gal) concrete reservoir for the removal of VOCs from groundwater, construction costs for MSA were lower than those for PTA. However, estimated annual operating and maintenance costs for the PTA process were lower because PTA uses less power.

MSA was selected because it offered the best means of accommodating site constraints and aesthetic concerns. It did not require additional space at the site, allowing room for expansion of the water softening facility and new perimeter landscape buffers. Enclosing the MSA process in the covered reservoir also eliminated noise and improved the aesthetics of the VOC removal process.

Resolving Design Issues

Potential health risks from process air emissions had to be evaluated because MSA generates airborne VOCs. The South Coast Air Quality Management District (SCAQMD) de-

terminated that Santa Monica needed a health risk assessment and a permit-to-construct for the plant expansion.

The city's consultant conducted a health risk assessment of the proposed treatment plant using the conservative assumption that 100% of all detectable VOCs would be removed. They further assumed that the plant would operate nonstop at maximum capacity for the estimated 70-year lifetime of the maximally exposed individual. Because the off-gases are discharged in the vicinity of several high-rise buildings, dispersion modeling of off-gases was also conducted, taking into account both climatic factors and building wake effects.

Results indicated that the excess cancer risk factor for all detected VOCs was *de minimis*, with the estimated potential risk of exposure to the most highly exposed individuals less than one in one million. Nevertheless, to address community concerns and minimize potential exposures even further, the consultant designed an off-gas treatment process using vapor-phase granular activated carbon (GAC) to adsorb VOCs from the off-gases.

The MSA Process

The Arcadia plant removes VOCs from influent groundwater by means of a 15-stage MSA process. The process causes a transfer of VOCs from water to air by applying energy directly to the water surface. The series of 15 completely mixed MSA stages simulate a plug flow reactor. Each stage is fitted with a mechanical surface aerator that acts as a floating water fountain, drawing water from the bottom of the reservoir and sending it into the air in a circular spray pattern. Although these aerators are commonly used at wastewater treatment plants to mix and oxygenate wastewater, a large-scale municipal application to remove VOCs is new.

The air space inside the process portion of the reservoir is controlled by vertical, flexible membrane barriers and an off-gas collection and treatment system. The aeration process takes up approximately 45% of the reservoir's capacity.

Induced draft blowers draw air through the air space above the aerators (thus collecting the off-gases) and then through mist eliminators into a duct system. The off-gases are then heated to reduce relative humidity and forced through beds of granular activated carbon to adsorb the VOCs. Cleansed off-gases are then vented to the atmosphere through a 9-m (30-ft) stack.

Benefits to the Community

"By treating and removing VOCs in the groundwater, we can make greater use of groundwater resources, reduce our costs for producing water, and provide Santa Monica with a reliable water supply," said Bob Harvey, Arcadia plant superintendent. "The MSA process can be used by other plants in densely populated areas like ours where space is limited, and where aesthetics, noise, and public health issues may be a concern."

—*Craig Lichty, Joe Drago, and Rena Chin, Kennedy/Jenks Consultants, San Francisco, Calif.*

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ATTACHMENT C

Statement of Qualifications

INTRODUCTION

In recent years, regulations governing the generation, treatment, storage, transportation and disposal of industrial wastes and hazardous materials have proliferated, becoming increasingly stringent and all-encompassing. Now more than ever, our clients need help responding to regulatory pressures. By forging a close client-consultant partnership with Kennedy/Jenks Consultants, industrial managers can rely on our environmental expertise to guide them through the perplexing maze of regulations.

Kennedy/Jenks Consultants would like to build such a partnership with you. With our comprehensive range of capabilities, we can satisfy your environmental needs, ensure compliance with pertinent regulatory requirements, and develop innovative approaches and cost-effective solutions that will allow you to concentrate on doing what you do best -- running your business.

This SOQ provides a brief overview of our firm, history, capabilities, experience, and staff. We welcome the opportunity to talk to you in person to explore your concerns. To learn more about how our experience can help you meet your environmental needs, please call Bob Booher at (916) 362-3251.

HISTORY

The regulatory actions that gave birth to the industrial service market were initiated in the early 1970s by the U.S. Environmental Protection Agency (EPA) and involved the Clean Air and Clean Water Acts. By 1980, the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response Compensation and Liability Act (CERCLA) were implemented. These laws have been amended periodically, being made significantly broader and tougher in subsequent years.

In addition to federal laws, there are numerous state, county, and local laws and regulations related to environmental protection. These can vary from county to county, state to state, and companies with sites in different areas often face different local restrictions.

Our Industrial Services practice was started in 1981 to meet the unique multi-disciplinary needs of industrial clients. The Industrial Services staff is complemented by the engineering and scientific resources of Kennedy/Jenks Consultants, which has provided environmental engineering and scientific studies, engineering design, and construction management services to private and public clients for more than 75 years.

CAPABILITIES

Kennedy/Jenks Consultants' capabilities extend from project conceptualization through construction and start-up.

We recognize that each project is unique, and we tailor our services to address the special demands of each situation.



CAPABILITIES

Kennedy/Jenks Consultants is a full-service consulting environmental science and engineering company with a wide range of capabilities. Capabilities provide include but are not limited to the following:

Site Investigations

- Site History Evaluations
- Preliminary Site Assessments
- Property Transfers
- Geohydrological Assessments
- Chemical Fate & Mobility Studies
- CERCLA Remedial Investigations (RI)
- RCRA Facility Investigations (RFI)
- Ecological Assessments

Risk Assessments

- Public Health Evaluation
- Air Quality Modeling
- Toxic Air Contaminant Risk Screening
- Exposure Pathway Analysis

Site Remediation

- RCRA Corrective Action Programs
- CERCLA Feasibility Studies (FS)
- Remedial Action Plans (RAP)
- Engineering Design of Remedial Actions
- Onsite Construction Review and Testing
- Underground Tank Upgrade
- Interim Remedial Measures

Environmental Management

- Strategy Formulation
- Environmental Audits
- Compliance Monitoring
- Permit Applications
- Siting Evaluations
- RCRA Closure Plans
- Stormwater Management Plans
- Hazardous Materials/Waste Management Plans
- Risk Management and Prevention Programs
- Spill Prevention, Control, and Countermeasure Plans
- Cost Recovery and Litigation Support

TOTAL QUALITY MANAGEMENT

A part of our Quality Assurance/Quality Control (QA/QC) system is our Continuous Quality Improvement Process (CQIP). The objective is continuous improvement in the quality of services and work provided to clients. Our CQIP in essence represents our adaptation of the Total Quality Management process. It includes continuous adjusting to changing needs and expectations. Quality is defined and measured by our clients.

Project specific QA/QC and CQIP include:

Project Memorandum

Defines the scope of the project, who will accomplish what and when to meet the objectives of the project. It includes the designated project Quality Control Reviewer. Provides the basis for the concept and criteria review.

Concept and Criteria Review

A review in the early stages of the project with peers, senior staff, and specialists that focuses on technical approaches to ensure that the project is proceeding smoothly and correctly toward the objectives. Periodic adjustments are made as required.

Ongoing Quality Reviews

Designated Project Quality Control Reviewers assure that prepared documents receive sufficient review.

Project De-Briefing

Upon completion, projects are reviewed to see what went right or wrong and why, providing us with a basis for continuous improvement.

Our Goals

Our goals include doing the job correctly and cost-effectively the first time.

***Process and
Facilities Design***

- Hazardous Waste Minimization/Treatment
- Hazardous Waste Storage
- Spill Containment
- Water Treatment
- Industrial Wastewater Treatability/Treatment
- Air Pollution Control
- Industrial Facilities
- Preparation of Plans, Specifications, Cost Estimates, and Construction Schedules
- Operational Management

***Construction
Management***

- Construction Surveillance, Resident Engineering, and Quality Control
- Construction Contract Administration
- Startup Services, Operational Training, and Operation and Maintenance Assistance

***Extensive Support
Capabilities***

Kennedy/Jenks Consultants' support capabilities include:

- Computer-based project planning and tracking programs that enhance efficient scheduling and closer scrutiny of project costs.
- Full-service drafting capabilities using computer-aided design and drafting (CADD).
- Computer-aided hydrogeologic, hydraulic, and air quality modeling.
- In-house library for tracking current environmental regulations and technical information; supports on-line connections to a vast array of environmental databases.

EXPERIENCE

What does it take for a consulting environmental services company to succeed? Modern equipment, efficient management techniques, and the most determined staff can best succeed when they are guided by experience.

At Kennedy/Jenks Consultants, our experience is our compass, keeping us pointed in the right direction, no matter what new ground we cover.



ENVIRONMENTAL SERVICES

Broad Range of Experience

Our projects have included:

- **Hazardous Waste Site Investigation and Remediation.** RI/FSs, RAPs, RFIs, community awareness programs, training, remedial design, and implementation and construction management during remediation.
- **Environmental Assessment.** Pre-purchase property evaluations, (Phases I, II, III, and additional), risk management planning, environmental toxicity/exposure assessment, risk characterization and development of appropriate cleanup levels, SARA Title III compliance and reporting, and industrial hygiene surveys.
- **Industrial Process Engineering and Industrial Facilities Design.** Assessment of wastewater pretreatment and water treatment systems, including identification and evaluation of treatment alternatives. Feasibility studies and abatement alternative evaluations for air quality control. Siting and permit assistance, bidding and specifications, and construction management.
- **Analytical.** Complete California certified laboratory services available for pilot and bench studies.

Regulatory Experience

We can lead you past the acronyms and jargon to arrive at sound, workable answers that comply with environmental rules. Our engineers and scientists have daily working knowledge of the Clean Air Act (CAA), Safe Drinking Water Act (SDWA), Clean Water Act (CWA), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Superfund Amendments and Reauthorization Act of 1986 (SARA), and local and state regulations.

**Project Qualifications:
Hazardous Waste Site Remediation**

Kennedy/Jenks Consultants

Project/Client	Description/Time Frame	Key Features
<p>Site Remediation, Underground Tank Removal, and Project Design</p> <p>Champion International Corporation Seattle, WA</p>	<p>Supplemental investigation, remedial action assessment, risk assessment, remedial alternatives development, and preferred alternative selection for remediation of contaminated areas at a former plywood manufacturing facility. Preparation of plans, specifications, and bid documents for structure removal and replacement, soil excavation, groundwater removal, and capping.</p> <p>6/1987 - Present</p>	<ul style="list-style-type: none"> • Remedial action assessment of PCP and dioxin contamination at one location and PAH contamination at another site. • Regulatory agency liaison. • Soil and groundwater investigation plan developed upon discovery of an unknown underground storage tank with apparent leakage of organic solvents.
<p>Remedial Investigation and Feasibility Study</p> <p>Santa Clara County Transportation Agency</p>	<p>Groundwater and soil characterization, site facilities audit, development and implementation of IRM, and development and selection of remedial alternatives.</p> <p>10/1988 - Present</p>	<ul style="list-style-type: none"> • Developed workplan and implemented field investigation (soil gas, drilling, well construction and sampling) and construction scoping and cost estimating. • Regulatory liaison with RWQCB. • Emergency response services assisting the county in responding immediately to a fuel spill during excavation of soil around a diesel pipeline.
<p>RFI/CM Pearl Harbor Naval Base Complex Honolulu, HI</p>	<p>Performance of RCRA Facility Investigation (RFI) at naval base complex. Evaluation of 182 Solid Waste Management Units (SWMUs). Documentation of no further action recommendations for some units. RFI Workplan developed for other units, including sampling and analysis plans, community relations plan, health and safety plans, and data management plan for 22 separate groups of units.</p> <p>5/1988 - Present</p>	<ul style="list-style-type: none"> • One of nation's first RCRA Facility Investigations at a military installation. • SWMU Characterization and RFI Workplan within 15-month timetable established in RCRA permit.
<p>R/FS and Remedial Design at Superfund Sites</p> <p>Confidential Clients* throughout the West</p>	<p>Phased R/FS and development of Interim Remedial Measures (IRMs). Characterization of VOCs, metals, pesticides, PCBs, and other contaminants in soil and groundwater. Engineering and construction management services during site remediation and closure activities. Implementation of soil vapor extraction IRMs and groundwater extraction and treatment systems, including air stripping facilities.</p> <p>9/1984 - Present</p>	<ul style="list-style-type: none"> • Quarterly water quality monitoring and reporting. • Extensive risk assessment support for mitigating human exposure to chemicals of concern in groundwater. • Implementation of large-scale extension of alternative water supply system. • Active participation in site management decisions involving client, counsel, and regulatory agencies.

* Due to confidentiality agreements with these clients we are not free to identify them herein. However, additional references to those listed above can be provided on a confidential basis.

**Project Qualifications:
Soil Bioremediation**

Kennedy/Jenks Consultants

Project/Client	Description/Time Frame	Key Features
<p>Commercial Soil Bioremediation Facility Operations Plan and Support</p> <p>Commercial Landfill Owner* Storey County, Nevada</p>	<p>Preparation of Operation and Management Plan ("OMP"), permitting assistance, and operations support for a commercial land-farming facility. The OMP described waste acceptance criteria and institutional procedures, including health and safety practices, process and environmental monitoring procedures, leachate management plans, and leak detection and monitoring schedules.</p> <p>7/1992 - Present</p>	<ul style="list-style-type: none"> • Preparation of Operation and Management Plan. • Regulatory agency liaison. • Ongoing operations support and consulting services. • Ongoing sampling and analysis support.
<p>Site Investigation, Remedial Design, Site Remediation</p> <p>Confidential Client* Oakland, California</p>	<p>Environmental assessment as part of a property transfer process involving a former foundry and engine manufacturing facility. Characterization of soil, groundwater, surface water, casting sands, and concrete. Design and implementation of groundwater extraction and treatment system. Specifications and oversight for excavation and treatment of soils. Permitting assistance for air emissions and discharge of treated water.</p> <p>1/1988 - 12/1990</p>	<ul style="list-style-type: none"> • Coordination with facility personnel to expedite investigation and remediation and to minimize delay of sale. • Remedial actions included onsite landfarming of 30,000 cubic yards of soil containing gasoline, diesel fuel, and bunker oil. • Characterization of chemicals of concern, including petroleum hydrocarbons, chlorinated solvents, polynuclear aromatic hydrocarbons, metals, and PCBs.
<p>Site Investigation, Remedial Design, Support for Soil Remediation</p> <p>Former Dairy Facility* Merced County, California</p>	<p>Site investigation, permitting assistance, design specifications, and construction management for biocell construction and excavation of soil. Provided operations and monitoring support to assist a client-directed soil treatment operation.</p> <p>7/1988 - 9/1988</p>	<ul style="list-style-type: none"> • Phased approach to excavating and segregating impacted soils, thereby limiting volume of soil that required remediation. • Onsite landfarming of 700 cubic yards of soil containing gasoline. • Operations assistance, monitoring, and confirmation sampling, to assist client in conducting landfarming operations.
<p>Site Investigation, Remedial Design, Site Remediation</p> <p>Confidential Clients* throughout Northern California</p>	<p>Site investigation, regulatory liaison, remedial planning and design, and site remediation, including design specifications, construction management, and oversight. Soil remediation at all sites. Chemicals of concern included petroleum hydrocarbons, chlorinated solvents, and heavy metals. Clients include transportation agencies, a truck manufacturer, a pencil manufacturer, and a construction equipment repair facility.</p> <p>12/1988 - Present</p>	<ul style="list-style-type: none"> • Remedial actions, including onsite landfarming of from 2,500 to 10,000 cubic yards of soil containing diesel, or diesel, oil, and grease. • Soil remediation at all sites included design specifications and oversight for biocell construction, tank removal, excavation, and soil treatment. • Building demolition, treatability testing, extraction and treatment of groundwater, and groundwater monitoring at some sites.
<p>Agrichemical Sump Closure and Soils Bioremediation</p> <p>Confidential Clients* throughout San Joaquin Valley, California</p>	<p>Characterization and closure of unlined washwater sumps and washracks associated with the cleaning of agricultural equipment, including agricultural spray rigs. Excavation of soils, closure of sump in accordance with RWQCB guidelines, and development of remediation alternatives for affected soils. Design specifications, construction management, and operations oversight for bioremediation of affected soils.</p> <p>11/1989 - Present</p>	<ul style="list-style-type: none"> • Onsite landfarming of from 100 to 900 cubic yards of soil containing oil and grease, simazine, and glyphosphate. • Proactive work schedule complementing normal agricultural activities at two sites without involvement of regulatory agencies and their attendant schedules. • Successful negotiations with RWQCB to handle sump closure and bioremediation as separate issues, thereby expediting site cleanup.

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**Project Qualifications:
Facilities Engineering**

Project/Client	Description/Time Frame	Key Features
<p>Fuel Spill Prevention Facilities</p> <p>U.S. Naval Air Station Adak, Alaska</p>	<p>Kennedy/Jenks Consultants designed an aircraft field spill prevention facility for the U.S. Naval Air Station in Adak, Alaska. This facility provides containment, treatment, and disposal of wastes from fuel loading spills.</p> <p>The design project included removal of existing concrete curbs and portions of concrete slabs at the fuel loading stands and installation of new concrete paving in streets and at the hardstand; repair of existing asphalt concrete paving in streets and at the hardstand; replacement of electrical wiring, motor controllers, relays, and relay panels.</p>	<ul style="list-style-type: none"> • Oil spill containment basins at three fuel oil loading facilities • Rehabilitation of sectionalizing valves and the system used for operating the valves (the system is used to control the flow of fuel oil from the storage tanks to distribution points)
<p>Evaluation of Facility Requirements</p> <p>U.S. Navy Naval Support Station Diego Garcia, B.I.O.T.</p>	<p>Kennedy/Jenks Consultants recently completed a comprehensive evaluation of the facility requirements and an optimum land utilization plan for Navy and Air Force airfield stations. Buildings and appurtenances were planned and designed for airfield support functions required for airfield operations. The project included establishing facility requirements, and planning and designing an air operations/administration building, an avionics/maintenance building, a demineralized water plant, a warehouse, and an air cargo handling/staging field, all situated on one site adjacent to an airfield parking apron.</p>	
<p>POL Storage Facilities</p> <p>U.S. Air Force Wake Island</p>	<p>Kennedy/Jenks Consultants was involved in the design of POL storage, pumping, and pipelines facilities at Wake Island Air Force Base.</p> <p>Kennedy/Jenks coordinated the field work at the project site, which included a topographic survey of existing and proposed locations for new facilities. A surface investigation, soil resistivity tests for cathodic protection systems, ultrasonic testing of existing tanks, verification of piping valves, pumps and other appurtenances with record drawings, and a survey of the electrical.</p>	<ul style="list-style-type: none"> • Design of a new 100,000 BBL storage tank and modifications to 6 existing tanks • Design of fuel pump house pipelines, hose reel pads and floating fuel lines, storage tanks fire protection system, spill containment dikes, and cathodic protection system

**Project Qualifications:
Industrial Facility Design**

Kennedy/Jenks Consultants

Project/Client	Description/Time Frame	Key Features
<p>Facilities Expansion Program Various Locations</p> <p>ETICAM</p>	<p>Planning, permitting, and design/construction management of facilities to expand operations of the only licensed commercial metals reclamation facilities in the United States. Process capabilities for metal bearing liquids expanded to process additional volumes of liquid waste and develop capability to treat metal bearing sludges.</p> <p>1989 - Present</p>	<ul style="list-style-type: none"> • Assistance with regulatory agency liaison/public hearings. • Fast track design and construction of initial expansion project within 135 days.
<p>Pretreatment Facility Northern California</p> <p>Confidential Client *</p>	<p>Study, plan, design, construction management, and start-up of pretreatment facility to bring a bakery into compliance with state and federal regulations.</p> <p>1989 - Present</p>	<ul style="list-style-type: none"> • Preparation of Risk Management Prevention Plan. • Bench scale and treatability tests to determine most efficient, cost-effective pretreatment process.
<p>Process Development/ Facility Design</p> <p>Reynolds Metals Company Longview, WA</p>	<p>Treatability testing, process development, engineering design and specification of complete wastewater treatment system, including process tanks, clarifier, effluent filter, raw material storage and feed, sludge dewatering, process instrument and control system.</p> <p>6/1986 - 9/1987</p>	<ul style="list-style-type: none"> • Removal of complexed cyanide, fluoride, aluminum and organics. • Complete comprehensive scope, from treatability testing through process development and design.
<p>Industrial Wastewater Treatment Facility</p> <p>Varian EIMAC Division San Carlos, CA</p>	<p>Design and construction management of \$1.0 million treatment system consisting of cyanide destruction, pH adjustment, clarification, filtration, and solids handling. Design of acid and cyanide waste conveyance system to the treatment area.</p> <p>1/1984 - 1/1985</p>	<ul style="list-style-type: none"> • Fast-track design, including pre-purchase of process equipment to meet a DHS mandated schedule, and construction and operation in six months without costly shutdowns to existing operations. • Compliance with state and local regulations. • Flexibility of treatment to accommodate current waste streams and future changes in wastewater characteristics.

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**Project Qualifications:
Industrial Process Engineering**

Kennedy/Jenks Consultants

Project/Client	Description/Time Frame	Key Features
<p>Industrial Pretreatment</p> <p>United Airlines San Francisco, CA</p>	<p>Sampling and analysis of wastewater discharges at the maintenance base and recommendation of process additions to meet new stringent limitations on heavy metals. Recommended project could save 25% or more of hazardous materials disposal costs.</p> <p>6/1988 - Present</p>	<ul style="list-style-type: none"> • Bench scale tests to screen alternative treatment processes for heavy metals removal. • Pilot scale testing to prove co-precipitation process performance.
<p>Industrial Waste Assessment</p> <p>TAM Engineering Corporation Tacoma, WA</p>	<p>Preparation of engineering report to assess treatment/source control needs for industrial wastewater and stormwater at an engine rebuilding facility. Detailed sampling and analyses program for all waste streams, remediation of continuing sources to the wastewater/stormwater system, and identification and evaluation of permanent waste minimization techniques.</p> <p>3/1987 - 11/1988</p>	<ul style="list-style-type: none"> • Program to comply with order from Washington Department of Ecology. • Implementation of waste minimization techniques to eliminate a wastewater discharge.
<p>Process Waste Storage/ Treatment Facility Evaluation</p> <p>Boeing Commercial Airplane Company Seattle, WA</p>	<p>Study to determine best method of storing process waste prior to treatment. Preparation of process and instrumentation diagrams, evaluation of system hydraulics, recommendations for treatment systems improvement/upgrade.</p> <p>1985 - 1988</p>	<ul style="list-style-type: none"> • Study to address new NPDES permit conditions and RCRA requirements. • Cyanide, heavy metals, and oily wastes.
<p>Wastewater Treatment Plant Optimization</p> <p>Varian Associates Palo Alto, CA</p>	<p>Development and implementation of innovative, cost effective wastewater program resulting in improved water quality performance. Activities included laboratory and field testing, development of action plan and design of system improvements. Recommendation of a series of interim and long-term modifications to the wastewater system to enhance heavy metal removals.</p> <p>1/1983 - 1/1984</p>	<ul style="list-style-type: none"> • Project given Industry of the Year Award by the Industrial Waste Committee of the California Water Pollution Control Association. • Development of Action Plan to improve use of existing facilities. • Improvements to meet local agency requirements.

**Project Qualifications:
Property Assessments**

Kennedy/Jenks Consultants

Project/Client	Description/Time Frame	Key Features
<p>Property Transfer Site Assessment Confidential Client* Kings County & Kern County California</p>	<p>Site assessment for property transfer involving the sale of 8,675-acres of agricultural and oil production properties by a private concern to a public water agency. 6/1988 - 9/1988</p>	<ul style="list-style-type: none"> • Aerial and ground reconnaissance. • Review of aerial photography. • Review of agricultural chemical use permits. • Groundwater sampling and analysis of existing wells. • Surface and subsurface soil sampling and analysis.
<p>Property Transfer Site Assessment State of California, Dept. of Corrections</p>	<p>Site assessment for property transfer for the State of California Department of Corrections at the site of a proposed prison facility in East Los Angeles. Property was used for railroad operations for 100 years. 1/1988 - 3/1988</p>	<ul style="list-style-type: none"> • Review of historical aerial photography and public records. • Test borings to collect soil samples for chemical analysis. • Soil gas sampling and on-site analysis by gas chromatography. • Develop remedial action design and cost estimate for property. • Assist State in negotiating purchase of property.
<p>Property Transfer Review of Environmental Investigations Bioscience Firm (Confidential Client*) San Francisco, California</p>	<p>Review of environmental investigations at site considered for purchase. Conducted technical review of multi-million dollar facility and surrounding property to fulfill "due diligence" portion of property transfer agreements. 12/1991 - Present</p>	<ul style="list-style-type: none"> • Reviewed disclosed site history documents regarding geology, hydrogeology, and potential for chemical migration onsite. • Reviewed permit applications and regulatory requirements for water, wastewater, and air emissions. • Recommended additional site investigation to uncover impacted groundwater which previously had been thought unaffected. • Oversight for additional characterization; client apprised of progress and potential alternatives.
<p>Phase I Property Transaction Environmental Assessments FNS Corporate Funding California and 16 other states</p>	<p>Phase I Property Transaction Environmental Assessments (PTEA) for approximately 120 residential and commercial properties prior to FNS Corporate Funding acquiring the loans on the properties. Properties were located in-state and in sixteen states outside of California. 5/1990 - 1/1991</p>	<ul style="list-style-type: none"> • Conducted property inspections. • Conducted regulatory agency file reviews. • Obtained and reviewed property title histories. • Reviewed historical aerial photographs and business directories. • Conducted PTEA according to Fannie Mae and FNS Corporate Funding's guidelines. • Completed PTEAs within budget and on schedule (within 120 days).
<p>Phase I Environmental Assessment WSJ Properties Palo Alto, California</p>	<p>Phase I Environmental Site Assessment and sub-surface investigation of existing railroad right-of-way to identify areas or issues that might pose potential environmental risks. Site has been used as a railroad right-of-way since the early 1900s. 3/1992 - 3/1992</p>	<ul style="list-style-type: none"> • Site reconnaissance. • Review of site history. • Study of aerial photographs. • Review of regulatory records and lists. • Contact local and state agencies. • Soil and water sampling to test for TPH, VOCs, pesticides, PCBs, California Title 22 Priority Metals, semi-volatile organics, and oil and grease.

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**Project Qualifications:
Underground Storage Tanks**

Project/Client	Description/Time Frame	Key Features
<p>Cost Recovery Litigation Support Leaking Underground Storage Tank</p> <p>Confidential Client* San Francisco, California</p>	<p>Provided technical assessment and expert witness support for a property owner pursuing a cost recovery action involving a former gasoline service station. Reviewed site documents and provided technical and regulatory support for adequacy of site investigation and remediation conducted by other parties.</p>	<ul style="list-style-type: none"> • Expert testimony. • Case settled and client awarded compensation for damages.
1992		
<p>Underground Storage Tank (UST) Removal, Design, Replacement and Construction Management at Industrial Gas Plant</p> <p>Confidential Client* Union City, California</p>	<p>Developed a program for a major industrial gas manufacturing company to bring its Union City, California facility into compliance with state and local regulations. A comprehensive approach was taken that included the development of tank removal and replacement plans and specifications, and construction management. Managed remediation of contaminated soils through onsite aeration in accordance with Bay Area Air Quality Management District regulations.</p>	<ul style="list-style-type: none"> • Removal of four fuel tanks and one acetone tank and replacement with a new design. • Soil and groundwater investigation and remediation. • Execution on-time and in compliance with very strict regulatory agency oversight.
1989 - 1991		
<p>Site Characterization and Source Removal for an Asphalt Paving Construction Company</p> <p>Confidential Client* Oakland, California</p>	<p>Completed a site characterization of a sixty-five year old facility for an asphalt paving construction firm in Oakland as part of an effort to prepare the facility for redevelopment. Removed five USTs containing gasoline, diesel and waste oil as sources of soil and/or groundwater contamination. Provided construction management services to monitor tank removal contractors' compliance with Bay Area Air Quality Management District and Alameda County Health Department regulations.</p>	<ul style="list-style-type: none"> • Removal and remediation of five USTs. • Regulatory agency negotiations. • Construction management services.
1990-1991		

**Project Qualifications:
Underground Storage Tanks**

Project/Client	Description/Time Frame	Key Features
Confidential Client San Francisco, California	<p>Providing ongoing consulting services for closure of a former heating oil tank which is enclosed in a concrete vault and is in the right-of-way of a major city street. Prepared workplans for the investigation and closure, and observed and documented field work. Also collected and analyzed samples. The project requires careful coordination with other construction work occurring at the site. Kennedy/Jenks is agency liaison with the City and County of San Francisco's Department of Public Health and Department of Public Works.</p>	<ul style="list-style-type: none"> • UST closure in major traffic thoroughfare. • Construction management services. • Close coordination with ongoing utility upgrade and relocation projects.
Santa Clara County Transit Agency, San Jose, California	<p>Prepared the Underground Storage Fund Application for transportation sites within the Santa Clara County Transit Agency (Agency). Performed the determination of eligibility and assembled the appropriate documentation to support the Agency's claim. The application process included the preparation of the statement of costs for corrective action, a description of the contaminated sites, prioritization of the claim, and review of all financial documents associated with corrective action.</p>	<ul style="list-style-type: none"> • Review and analysis of the financial data/information for the Environmental Cleanup Fund. • Application could result in the reimbursement of approximately \$3 million for costs associated with the investigation and cleanup of UST releases.
1992		

**Project Qualifications:
Regulatory Compliance**

Kennedy/Jenks Consultants

Project/Client	Description/Time Frame	Key Features
<p>Environmental Compliance Assistance Santa Clara County Transportation Agency</p>	<p>Development and implementation of a comprehensive, multi-phased environmental compliance program. The program provides regulatory assistance for a number of airports, bus operations, road maintenance operations, and a light rail system. Agency-wide evaluation consisting of on-site audits, regulatory guidance, and corrective action procedures. Coordination of the compliance program by interfacing with in-house staff, appropriate regulators, Agency contractors, and legal counsel.</p>	<ul style="list-style-type: none"> • Developed regulatory compliance program. • Conducted negotiations among regulatory agencies, contractors, consultants, legal counsel, and client. • Provided technical assistance on environmental regulations such as RCRA, CERCLA, TSCA, FIFRA, Title 22, air, wastewater, and Santa Clara County hazardous materials/waste requirements.
1991 - Present		
<p>Environmental Compliance Program City of Sunnyvale</p>	<p>Evaluation, development, and implementation of a comprehensive, regulatory compliance program for the City of Sunnyvale's Corporation Yard. Kennedy/Jenks Consultants has addressed the City's environmental issues by: providing a thorough audit of existing programs; providing training; monitoring and inspecting the site's compliance status; managing hazardous waste; preparing and submitting regulatory compliance documents; and supporting the site on specific technical issues such as engineering designs, effluent analysis, and regulatory interpretations.</p>	<ul style="list-style-type: none"> • Conducted a thorough audit/inspection of the facility and its program. • Conducted routine evaluations of the site's hazardous materials/waste practices. • Prepared and submitted appropriate regulatory documentation to federal, state, and local agencies. • Provided technical assistance in developing a comprehensive environmental program.
1993 - Present		
<p>Environmental Compliance Audits Burlington Northern Railroad Nationwide</p>	<p>Performance of environmental audits at 27 major railroad shop facilities in over twelve states. Audits focused on RCRA and state hazardous waste compliance. Assessment of compliance with solid waste, tank, air, wastewater, storm water, and worker and community right-to-know regulations. Follow-up audits two years after initial site visit to reassess compliance.</p>	<ul style="list-style-type: none"> • Provided ongoing regulatory services to monitor and reassess compliance status. • Conducted a thorough and comprehensive regulatory audit of company facilities. • Assisted company in the interpretation and implementation of federal, state, and local regulations.
1988 - Present		

Kennedy/Jenks Consultants

Project/Client

Description/Time Frame

Key Features

Regulatory Compliance Program
Air Liquide Corporation
Northern and Southern California

Development of site specific and company-wide regulatory compliance programs at six sites. Areas of responsibility include the preparation of regulatory specific reports, comprehensive evaluations of site environmental programs, and characterization of soil and groundwater contamination. Recommendation and implementation of corrective action procedures to address environmental deficiencies.

- Developed company-wide regulatory compliance programs.
- Prepared environmental permits and documents.
- Prepared facility designs for site upgrades to comply with regulations.
- Provided regulatory consultation and interpretations on a number of environmental regulations.

1989 - Present

STAFF

Kennedy/Jenks Consultants' staff are highly qualified individuals with the knowledge, background, and experience to serve our clients well.

Each member of a Kennedy/Jenks Consultants project team has an established reputation for technical excellence and shares a strong commitment to individual responsibility. This means that each team member takes responsibility for solving client problems in a cost-effective manner, contributing to our level of technical excellence, and performing ethically and professionally.



STAFF

Our staff of highly qualified professional personnel has combined capabilities extending from project conceptualization through data collection and interpretation and, as appropriate, design, construction, start-up, and operation and maintenance. Our multi-disciplinary project teams enable us to solve problems responsively while meeting tight regulatory agency timetables.

We empower our Project Managers to command all necessary resources in order to complete the project. As a matter of policy, senior staff members participate in each project for review, quality control, technical guidance, and consulting in special situations.

Multi-Disciplinary Staff

Our staff of approximately 280 highly qualified professional and support personnel includes:

- Civil, sanitary, chemical, environmental, mechanical, electrical, and structural engineers.
- Chemists, biologists, environmental scientists, and public health specialists.
- Hydrogeologists, geologists, and geochemists.
- Architects and land surveyors.

Assembling Responsive Teams

Kennedy/Jenks Consultants has extensive experience in the planning, design, construction management and startup of a wide variety of industrial waste and hazardous waste projects. Working from this experience base, we are able to select the team best suited to each project. We carefully review and evaluate our client's needs and determine the specific skills, experience levels, knowledge, and work force to meet these needs.

Some of the people who might be assigned to one of your projects are introduced on the following pages.

MARTHA S. KNOWLTON, R.G.

**Manager of
Industrial Services**

Education:

University of California
Davis, B.S. Degree in
Geology, 1981

California State University
Fresno Graduate Studies in
Business Administration
1986-1987

Registration:

Registered Geologist in
California

Certification:

Environmental Manager in
Nevada

Health and Safety,
Certification for Hazardous
Waste Workers,
February 1988

Health and Safety,
Certification for
Supervisors of Hazardous
Waste Workers,
November 1988

Memberships:

California Groundwater
Resources Association

National Groundwater
Association

Western Wood Preservers
Institute

Ms. Knowlton is Manager of the Industrial Services Group in the Sacramento, California office. Ms. Knowlton is responsible for the administration of project managers and technical staff providing environmental engineering and scientific services to public and private clients.

Ms. Knowlton has participated in and managed geologic, hydrogeologic, and environmental studies of commercial and industrial sites in California, Nevada and Oregon. Her project experience includes site investigations, subsurface and surficial geologic mapping, drilling, groundwater monitoring well design and installation, water and soil sampling, interpretation of laboratory analytical results, site remediation, hazardous waste disposal and underground tank removals.

Ms. Knowlton has identified and evaluated environmental concerns at a variety of sites, including dry cleaner operations, railroad yards, wood products facilities, agribusinesses, resort and entertainment facilities and industrial maintenance yards.

Ms. Knowlton's experience includes the following:

- Project Manager for the review and oversight of the investigation, monitoring, and testing of PCE released from dry cleaning facilities in San Joaquin County. The project involves the review of RI workplans, and RI, FS and RAP reports prepared by the dry cleaners' consultant and implementation of field investigations, data collection and remedial action for compliance with the National Contingency Plan (NCP).
- Project Manager of a RCRA Facility Investigation (RFI) and Corrective Measure Study (CMS) for a former industrial facility located in Bakersfield, CA. Region 9 EPA identified three solid waste management units (SWMUs) that contain oily waste from an unknown source. Kennedy/Jenks' investigations have characterized the waste as highly acidic (< 2 pH) with elevated levels of PAHs, VOCs, and total petroleum hydrocarbons. Additional concerns include emissions of H₂S when soils are disturbed. Due to the proximity of the site to residences, an extensive public involvement program has been implemented. This program includes interviews with community

MARTHA S. KNOWLTON, R.G.

Page 2

Publications:

Unfried, C.L. and Knowlton, M.S. "Multi-Site, Multi-Phased Investigations for a Wood Products Company Property Transaction." Presented at the National Ground Water Association Environmental Site Assessment Conference, Orlando, Florida, August 1992.

Laudon, L.S. and Knowlton, M.S. "Recycling of Sandblast Materials into Asphalt." Presented at the North American Waste Exchange Conference on Industrial Recycling, Spokane, Washington, May 1991.

leaders, fact sheets, and public forums. Kennedy/Jenks is currently completing the RFI Report/CMS Workplan documents for submittal to the EPA.

- Project director for investigations and remediation at operating and non-active Oregon and California sawmill facilities for a national wood products company. Responsible for directing field investigation teams from various offices, overall project quality control and consistency, preparing scopes of work and budgets, and maintaining client and regulatory agency liaison in two states. Areas investigated include: former wood treatment areas, truck and equipment maintenance shops, aboveground and underground fuel storage tank facilities, wood waste piles, stormwater and water recirculation ponds, chemical storage areas, and landfills.
- Managed a fast-track environmental site assessment for the sale of a large recreational facility located within the Lake Tahoe Basin, California and Nevada. In a two-week period, the Kennedy/Jenks project team investigated 40 aboveground and underground storage tank facilities, tested tanks and piping for integrity, reviewed tank permit status and recommended a tank compliance program. Also conducted environmental audits of all facilities, including equipment and maintenance areas, which were located throughout the 7,500-acre property. The tank compliance program was implemented in one month and included tank removals, tank replacements, site investigations of tank leakages, reconnaissance groundwater investigations, and submittal of reports to regulatory agencies outlining remedial actions. Provided investigation and cleanup costs for areas not remediated to assist client during the property acquisition negotiations.
- Project Manager for the investigations and remediation of a locomotive battery restoration shop, containing lead contaminated soil, and railyard grit blast piles. Both sites are located at a locomotive maintenance facility named on the California State Superfund list. Supervised the preparation of RI reports, development of bench-scale studies, evaluation of remedial alternatives, and the preparation of RAPs and closure/post-closure plans.

MARTHA S. KNOWLTON, R.G.

Page 3

Successfully negotiated and implemented closure of both sites with the Region 1 - Department of Toxic Substances Control and the Central Valley RWQCB.

Kennedy/Jenks Consultants

JAMES G. CURTIS, P.E.

**Environmental Remediation/
Construction Management**

Education:

California State University
San Jose, Civil Engineering,
B.S., 1986.

California State University,
San Jose, Civil Engineering
with emphasis on Environ-
mental Engineering, M.S.,
1989.

Registration:

Professional Civil Engineer,
California

License:

State of California
Class A General Engineering
Contractor's License with
a Hazardous Substances
Removal Certification.

Memberships:

American Society of
Civil Engineers

Groundwater Resources
Association

James G. Curtis is a Registered Professional Engineer with extensive project experience in environmental remediation and construction management.

Mr. Curtis has over 7 years of experience in directing, executing, and supervising multi-faceted remediation efforts in California, Nevada and Oregon. His projects range from subsurface investigations of soil and groundwater to selection of remediation alternatives, design, permitting, installation, construction, operation, and maintenance of remediation systems. Prior to entering the environmental field, Mr. Curtis worked in the construction industry for 15 years supervising and managing new building construction and rehabilitation projects. His responsibilities included contract administration, project cost estimating and cost control, scheduling, materials inventory management, change order document, labor crew supervision and project close out.

Specific project experience includes the following:

Site Remediation

- Designed and conducted field pilot-scale studies for soil venting systems to determine the feasibility of this technology to remediate soils impacted with petroleum hydrocarbons and chlorinated volatile organic compounds.
- Based on the information gathered from field pilot-studies, designed, installed and operated soil venting systems to remediate of petroleum and solvent impacted soils for a number of aerospace manufacturers, car rental firms, and petroleum distributors throughout California.
- Bioremediation of diesel impacted soils for a timber molding and millwork plant in the Central Valley.
- Design and operation of Groundwater recovery and treatment systems for the remediation of petroleum and solvent impacted aquifers for numerous aerospace, car rental, and petroleum distributing firms in California.
- Mass excavation and off-site disposal/treatment of diesel and gasoline impacted soils for a variety of railroads, trucking, forest products, aerospace, car rental, and petroleum distributing firms in California, Nevada and Oregon.

JAMES G. CURTIS, P.E.

Page 2

- Bench-scale studies for soil washing of polynucleated aromatics for a former steel processing plant in Southern California.
- Treatability study for in-situ neutralization of low pH soils and remediation of VOCs and SVOCs in soils at a RCRA site in California's Central Valley.
- Decontamination and demolition of buildings impacted by manufacturing and/or agricultural chemicals.

Construction Project Management

- Served as Project Manager for most of the projects he has been involved in.
- Developed a satellite field office for the construction management of an \$85 million Class III sanitary landfill in Southern California.
- Served as Project Manager for a geotechnical residential hillside stabilization project.
- Served as Project Engineer on numerous construction projects. Responsible for project cost estimates and control, project scheduling, materials ordering, inventory and utilization, labor crew sizing and direction, project safety, and project documentation.
- Developed subcontractor bid documents for projects ranging from civil earthworks, building construction, underground utility installation and rehabilitation, soil and groundwater remedial system installation, and structures demolition.
- Provided bid evaluation and subcontractor selection services. Upon selection of a qualified subcontractor, developed and administered the subcontractor contract.
- Carpentry crew foreman.

Site Closures

- Negotiated site closures for railroads, aerospace manufacturers, petroleum distributors, trucking firms, and car rental companies.

JAMES G. CURTIS, P.E.

Page 3

Other Experience

- **Provide expert testimony in a case concerning compliance with the CERCLA National Contingency Plan, effectiveness of on site remediation of dinoseb impacted soils and groundwater, and subsurface migration of dinoseb.**
- **Permitting for environmental and construction projects.**

Anne M. Farr, Ph.D.

Consulting Geohydrologist
102 Flood Court
Folsom, CA 95630
(916) 351-9327
FAX: 351-9357

Education:

Colorado State University,
Ph.D. in Agricultural and
Chemical Engineering,
1992.

Specialization:
Groundwater Modeling/
Design of Monitoring
Networks

Stanford University, MS in
Civil Engineering, 1983
Specialization: Water
Resources Engineering

Stanford University, BAS
in Anthropology and Envi-
ronmental Earth Science,
1981

Memberships:

American Geophysical
Union

National Ground Water
Association

Groundwater Resources
Association

Registration:

Engineer-in-Training
in California, 1982

Dr. Farr has conducted numerous studies assessing the quantity and quality of groundwater. She has experience in all aspects of geohydrologic studies including development of site investigation plans, collection and analysis of geohydrologic and chemical data, identification of the sources of chemicals detected in soils and groundwater, and design of remediation systems. Her technical expertise includes the evaluation of subsurface fate and transport of compounds of concern both as miscible and immiscible liquids and as gases. She has been involved in projects concerned with a wide range of compounds of concern including chlorinated and non-chlorinated hydrocarbons, metals, and pesticides.

Dr. Farr completed her Ph.D. in the design of groundwater monitoring networks based on the integration of physical modeling and statistical analyses of water level and water quality data. While completing her degree Dr. Farr also developed a method for estimating the volume of LNAPLs (light non-aqueous phase liquids) in the subsurface based on observed levels of LNAPLs in monitoring wells.

Dr. Farr is currently providing consulting services on four project involving the fate and transport of Perchloroethylene (PCE) in the subsurface. Two of these projects involve the release of PCE from dry cleaning facilities. On one of these projects, Dr. Farr is overseeing the investigation at a shopping center in the Central Valley of California. Dr. Farr has evaluated the fate and transport of chemicals of concern in groundwater, evaluated sources of the contamination, and evaluated the persistence, mobility, and toxicity of the chemicals in the subsurface. Dr. Farr also provided expert witness services for litigation associated with the project.

Dr. Farr has also provided expert witness testimony for a semi-conductor manufacturer in Silicon Valley. Her testimony focused on the transport of trichloroethylene (TCE) from a waste sump through the subsurface to groundwater in both a liquid and gas phase. Her testimony was used to support claims against insurance companies.

Publications:

Farr, A.M., Houghtalen, R.J., and McWhorter, D.B. "Volume Estimation of Light Nonaqueous Phase Liquids in Porous Media," *Groundwater*, 28(1):1990, pp. 48-60.

Farr, A.M., "Optimal Design of Groundwater Quality Monitoring Networks," Ph.D Dissertation, Colorado State University, May 1992.

Professional History:

Anne M. Farr,
Consulting Geohydrologist,
October 1993 - present

Kennedy/Jenks Consultants
Senior Geohydrologist
1989-1993

Kennedy/Jenks Consultants
Geohydrologist
1983-1986

United States Geological
Survey - Water Resources
Division
Hydrologist
1982-1983

Dr. Farr provided expert witness testimony for an operating gasoline station site relative to the source, migration, and fate of petroleum hydrocarbons (and related constituents) in the subsurface of a neighboring downgradient gasoline station site. Dr. Farr is also currently providing litigation support services related to the release of petroleum hydrocarbon at a former power plant in the Central Valley, as well as at a former fueling station in the Central Valley. Both these two current projects involve the analysis of soil and groundwater data relative to the distribution of the petroleum hydrocarbons in the subsurface as well as the likelihood of different source release histories causing the observed contamination.

Dr. Farr also recently completed an analysis of the fate and transport of diesel in the subsurface both as an immiscible liquid and in the transport of miscible constituents of concern in groundwater. The investigation includes detailed multi-phase flow modeling. The results of the modeling were used to successfully support the client's position in litigation at the Site.

Dr. Farr is providing litigation support for a transportation company's defense at a Superfund Site in the Western United States. The principal chemicals of concern are petroleum hydrocarbons and pentachlorophenol (PCP). Her expertise is being used in the evaluation and identification of the source(s) of contamination and waste disposal, the fate and transport of chemicals of concern in the subsurface, and the effects of site removal actions on the distribution of chemicals of concern.

Civil Engineer

Mr. Durkin has nearly 14 years of civil engineering experience. Since joining Kennedy/Jenks Consultants in 1986, Mr. Durkin has worked on a variety of projects ranging from feasibility studies and master planning through design, construction management and resident engineering. Specific project experience includes the following:

Mr. Durkin was Project Manager for the City of San Buenaventura Baily Water Conditioning Facility Pilot Plant Evaluation and Expansion Study. He was responsible for the design, construction, and operational direction of the pilot plant to evaluate chemical oxidation, including ozonation, and high-rate dual-media filtration for hydrogen sulfide, iron, and manganese treatment. The facility will blend groundwater, surface water, and desalinated water. Final process selection considered performance in removal of taste and odor compounds and THMs.

Mr. Durkin is Project Manager for the City of Manteca Well No. 17 Pump Station and Treatment Facilities. The 1,200-gpm facilities will utilize GAC pressure filtration for EDB and DBCP removal. The project includes well design, pumping facilities, and a standby power generator.

Mr. Durkin was a Project Engineer for the Scotts Valley El Pueblo Water Treatment Plant. Preliminary engineering included pilot testing oxidation-filtration, aeration, and GAC filtration for VOC, iron and manganese treatment. Final design included a new pumping plant with a capacity of 1,500-gpm, aeration with off-gas scrubbing for VOC removal, and conventional oxidation-pressure filtration for iron and manganese treatment.

Mr. Durkin has represented Kennedy/Jenks Consultants as District Engineer for the Linda County Water District since 1987. In this role, he has participated in the planning, design, and services during construction of several projects, including the water and wastewater master plans; a pump station and aeration treatment plant for a new 3,000 gpm water well, improvements to the Wastewater Treatment Plant, water and sewer

Education: University of Illinois, Champaign - Urbana, B.S. in Civil Engineering, 1980

Registration:

Civil Engineer in California

Memberships:

American Water Works Association

California Water Pollution Control Association

Water Pollution Control Federation

Publications:

"Groundwater Treatment Pilot Testing for the City of Ventura," presented at the Channel Counties Water Utilities Association, February 1994.

"Iron and Manganese Treatment Using Oxide-Coated Filter Media," presented at the Cal-Nev AWWA Conference, April 1994.

"Hydrogen Sulfide, Iron and Manganese Treatment in Groundwater," presented at the Sacramento Area Water Works Association, July 1994.

KEITH B. DURKIN

Page 2

service for new residential development, and the addition of water distribution system piping and gravity sewer and forcemain to the wastewater collection system. Mr. Durkin has performed resident inspection services and office engineering during construction on several of the District's projects.

Mr. Durkin completed pilot testing, design, and construction management of new pump station, gas stripping and oxidation pressure filtration facilities for water treatment for five wells in the Linda County Water District. The project included three steel water storage tanks, total capacity of .6 MG, for backwash water storage and reclamation. The completed facilities have the capacity to treat 7,600 gpm (11 MGD).

Mr. Durkin was Project Manager for the predesign study for a new raw water supply pipeline for the Amador County Water Agency. The new pipeline brings water from the Tiger Creek Regulator Reservoir to the existing Buckhorn Water Treatment Plant for the Central Amador Water Project. Pipeline pressures will exceed 500 psi. The study developed design criteria, including existing and projected water demands, evaluated the treatment plant hydraulic requirements based on anticipated expansions, evaluated alternative pipeline routes and associated costs, identified permitting and regulatory issues, and developed an implementation plan.

Mr. Durkin served as Resident Engineer during eight months of construction of the City of Vacaville's Easterly Wastewater Treatment Plant Expansion Project. Total cost of construction for this project was nearly \$17 million. Mr. Durkin's inspection responsibilities during this period included reinforcing steel, structural concrete, structural masonry, welding and metal work, excavation, grading and paving, setting of pumps and process equipment, yard piping and utilities, and painting. Mr. Durkin was also civil engineering Project Engineer during design of the facilities.

Mr. Durkin served as Project Manager during the design and construction administration of the Roseville Water Treatment Plant Expansion. This project expanded the existing plant's capacity from 24 to 48 MGD with provisions for ultimate expansion to 96 MGD. As part of

KEITH B. DURKIN

Page 3

the expansion we recommended installation of a 110-foot solids contact clarifier, four new 8-mgd gravity dual-media filters, a new pumped jet diffuser system for rapid mixing, reclaimed water basin, a 4 MG storage and chlorine contact tank, and other process and instrumentation additions and improvements. We also installed tube settlers in the existing solids contact clarifiers to double their treatment capacity from 12-mgd to 24-mgd.

Other projects Mr. Durkin has performed project engineering or management on include:

- Design of a three million gallon concrete water storage reservoir and three miles of transmission pipeline for the Rancho Murieta Community Facilities District;
- City of Sacramento Robla Pump Station and 3 MG water storage tank;
- City of Manteca water system improvements, including a well and pump station;
- Preparation of the South Truckee Meadows Water Master Plan;
- Design of the Penryn wastewater collection system, pump station and force main.

Kennedy/Jenks Consultants

JOSEPH A. DRAGO, Ph.D.

**Water Quality/Process
Specialist**

Education:

University of California,
Berkeley, Ph.D. in Sanitary
Engineering, 1980

University of California,
Berkeley, MS in Sanitary
Engineering, 1971

Vanderbilt University, BE in
Civil Engineering, 1965

Registration:

Civil Engineer in California

Memberships:

American Society of Civil
Engineers: Member,
Technical Committee on
Nuclear Effects
American Water Works
Association
Water Pollution Control
Federation
Sigma Xi
Tau Beta Pi

Awards:

ASCE State-of-the-Art of Civil
Engineering, Co-recipient,
1980

Selected Publications/ Presentations:

"Removal of Radioactive
Contaminants from Aqueous
Laboratory Wastes by

Dr. Drago has extensive experience in environmental engineering, with particular emphasis on water studies and investigations, including water quality assessments.

Specific project experience includes:

Water Quality Assessment

- Responsible for 1) characterizing chemical and physical composition of backwash discharges and their effect on the water quality of a creek and 2) assessing engineering alternatives for mitigating water quality impacts (if necessary).
- Responsible for evaluating alternative screening technology for removing macro-organisms and micro-organisms from water discharged from a reservoir.

THM Control Investigations

- Developed bench-scale tests for simulating water treatment plant operations.
- Evaluated several methods of suppressing THM formation, precursor removal, and THM removal.
- Developed programs for controlling THMs.
- Santa Clara Valley Water District, California. Directed comprehensive test program including 1) full-scale plant testing of clarifiers to optimize their performance, 2) flash mixers, 3) flocculation basin baffling, 4) pilot testing of alternative filter media and full-scale plant testing of existing filters, and bench-scale evaluations on alternative THM control measures.

Radionuclide Experience

- AWWA Cost of Compliance Study for Radionuclides. As a subconsultant to RCG/Hagler, Bailly, responsible for the evaluation of treatment technology and economic impact of EPA's proposed radionuclide regulations. This study is being managed by the Radionuclide TAW.
- Cost of Compliance Evaluation for Proposed Radon Drinking Water Regulation. Project Manager of study for the

JOSEPH A. DRAGO, Ph.D.

Page 2

Chemical Treatment, with J.R. Buchholz, presented at 31st Annual Purdue Industrial Waste Conference 4-6 May 1976

"Evaluation of Ozone Treatment in Cooling Towers," with D.T. Merrill and D.S. Parker, presented at 35th Annual Purdue Industrial Waste Conference, 13-15 May 1980

"Removal of Radioactive Contaminants from Aqueous Laboratory Wastes by Chemical Treatment, with J.R. Buchholz, presented at 31st Annual Purdue Industrial Waste Conference, 4-6 May 1976

"Rational Design of Coarse Dual-Media Tertiary Filters," with R.W. Stone and D.T. Merrill, presented at ASCE National Environmental Engineering Conference, Nashville, TN, 13-15 July 1977

Association of California Water Agencies to assess the cost of compliance with EPA's anticipated drinking water standard for radon.

- **Carson River Management Program.** Co-authored of technical memorandum on water quality issues, including identification of radon as a potential concern for certain groundwater sources.
- **ASCE Technical Committee on Nuclear Effects, 1972-1985.** Participation in committee activities. Co-author of papers on nuclear facilities siting and nuclear waste management.
- **University of California at Berkeley and Los Alamos Scientific Laboratory.** Ph.D. research on chemical treatment of aqueous plutonium waste. Also conducted research on removal of americium, cesium, and strontium from aqueous wastes.
- **Atomic Energy Commission, 1965-1970.** As commissioned Navy Officer, involved with design and development work for Navy nuclear propulsion plants.

Air-Stripping Experience

- **Various Confidential Clients.** Preparation/Evaluation of conceptual designs of air-stripping facilities, including granular-activated carbon (GAC) off-gas treatment systems. Also, reviewed detailed designs for these facilities and evaluated the performance of full-scale operating systems.
- **City of Santa Monica.** Developed conceptual design of reservoir air-stripping facility, including GAC off-gas treatment system.
- **U.S. Navy.** Developed design of air stripper for carbon dioxide gas removal for demineralization facility.

Asbestos Evaluations

- **Asbestos water treatment evaluation for the California Department of Water Resources.** Served as 1) task leader on evaluation of health effects of asbestos in drinking water, including development of drinking water quality goals, 2) process consultant on water treatment plant site visits and evaluations of existing treatment facilities, and 3) technical reviewer on evaluation of existing water treatment plants to meet asbestos water quality goals.

SAID AMALI

Soil Physicist

Education:

Ph.D. University of California, Davis. Soil Physics, 1994.

M.S. in Soil Physics and B.S. in Agricultural Engineering. Oregon State University.

Publications:

Amali, S., Peterson, L.W. and Rolston, D.E. 1993. "Modeling Multicomponent Adsorption of Water and Volatile Organic Vapors on Soils." *Journal of Hazardous Materials* 36 (1) 89-108.

Amali, S. and Rolston, D.E. 1993. "Multicomponent Volatile Organic Vapor Diffusion: Steady-State Fluxes." *Journal of Environmental Quality* 22 (4) 825-831.

Amali, S., et al. 1993. "Soil Water Variability Under Subsurface Drip and Surface Furrow Systems." Paper submitted to *Irrigation Science*.

Memberships:
Soil Science Society of America (SSSA)
American Geophysical Union (AGU)

Dr. Amali's Ph. D. work is a study of trichloroethylene, benzene, and toluene multi-component vapor diffusion and adsorption in unsaturated soils.

Dr. Amali's university experience includes environmental fate and mobility modeling and experimentation relevant to organic chemicals, pesticides, fertilizers, and metals; contaminant adsorption, partitioning, and mass flux measurement in soils; water and solute transport experimentation in unsaturated soils; soil, water, and gas sample measurement, collection, management, and analysis.

Dr. Amali has knowledge of several EPA/USGS-sanctioned water and contaminant flow models and their physical basis and data requirements.

Dr. Amali also has education/knowledge in the areas of operations research/optimization routines/linear programming, interpretation of aerial photographs, irrigation, and statistics.

Mr. Amali has participated in various projects including:

- Risk Management and Prevention Program (RMPP) for several industrial facilities and included chlorine, sulfur dioxide, and ammonia air dispersion modeling using ALOHA, liquid and gaseous release rate determination using ARCHIE and technical document preparation.
- Lead leaching modeling in unsaturated soils.
- Construction and industrial Storm Water Pollution Prevention Plans (SWPPP).
- Tetrachloroethylene (PCE) vapor transport modeling through concrete foundations at dry cleaners.
- Groundwater flow and Pentachlorophenol (PCP) transport and fate investigation at a wood processing facility.
- Background groundwater Maximum Contaminant Concentration Level (MCCL) determinations and downgradient groundwater quality impact assessment using non-parametric statistics for a woodwaste landfill.

Kennedy/Jenks Consultants

ROBERT D. BUSBY

Hydrogeologist

Education:

University of California, Davis,
Hydrologic Sciences, M.S.,
1993

University of California, Santa
Cruz, Earth Sciences, B.S.,
1988

Certification:

Health and Safety,
Certification for Hazardous
Waste Workers, August
1993

Membership:

Ground Water Association

Publications:

"An Investigation of Saturation-Capillary Pressure Relations in Two- and Three-Fluid System for Several NAPLs in Different Porous Media," in preparation for Spring 1995 publication in the Journal of Groundwater

Mr. Robert D. Busby is a hydrogeologist with three years of experience managing and conducting soil and groundwater investigations, site assessments and remedial investigations. His project experience includes drilling, sampling, groundwater monitoring, well design and installation, aquifer testing, and interpretation of analytical and aquifer test results.

Mr. Busby is experienced in modeling the vadose and groundwater zones using MODFLOW, Flowpath and a variety of other models. Mr. Busby also conducted research on the three-fluid phase saturation-pressure relations of trichloroethylene, toluene and oil in water and air systems for a variety of soils.

Mr. Busby's experience includes the following:

Remedial Investigations

- **Aerospace Superfund Site - Chemical Plant Production.** Mr. Busby was responsible for characterizing the lateral and vertical extent of DNAPLs and VOCs in the vadose zone and in groundwater in an area containing ten source sites. Characterization of the vadose zone was conducted using geoprobe and auger rig soil vapor gas sampling techniques. The potential for soil vapor contamination from contaminated groundwater was assessed. Mr. Busby's responsibilities included oversight of soil vapor performance, QA/QC, worker health and safety, data analysis/interpretation, report writing, and providing recommendations for additional investigations.
- **Former Aerospace Facility, Burbank, California.** Conducted a soil vapor extraction pilot test designed to evaluate different remedial technologies. The pilot study consisted of installing pressure transducers, operating and maintaining a catalytic oxidizer and monitoring the performance of carbon absorption, pressure swing absorption and thermal absorption systems.
- **Industrial Site, Houston, Texas.** Modeled two groundwater aquifers contaminated with solvents. Model results were used to evaluate the effectiveness of existing groundwater extraction wells and to determine additional well locations.
- **Former Steel Plant, Richmond, California.** Mr. Busby conducted soil and groundwater investigations and an

ROBERT D. BUSBY

Page 2

aquifer testing and beneficial use study at a former steel mill site with confirmed petroleum hydrocarbon and solvent contamination in soil and groundwater. The aquifer testing and beneficial use study consisted of a field slug/bail-down test on existing monitoring wells for the determination of local shallow groundwater aquifer characteristics and research and review of documents relative to the site and regional groundwater.

- **Former Service Stations, Alameda County, California. Conducted numerous soil sampling and testing programs at former service stations. Analytical testing indicated petroleum hydrocarbon contamination at concentrations above regional action levels at the majority of the sites. Recommendations regarding additional soil and groundwater testing were provided. Supplemental soil and groundwater investigations were conducted at many of the sites.**

Environmental Site Assessments

- **Industrial and Agricultural Facilities in Alameda, Contra Costa, Napa and Santa Clara Counties, California. Conducted numerous environmental site assessments of industrial and commercial facilities proposed for redevelopment, new ownership or refinancing. Evaluated the potential for site specific contamination and the possible need for Level II soils investigations. Investigated historical property uses through examination of historical aerial photographs, Regional Water Quality Control Board Records, State Department of Health Services records, local county Fire Department records, city permitting records and through personal communications with individuals familiar with historical activities on or near the property.**

Geotechnical Investigations

- **Fault Investigations, Alameda and Contra Costa Counties, California. Supervised the excavation and shoring of trenches and the implementation of safety procedures on several fault location investigations. Provided insight for the investigation and description of fault features and assisted in the supervision of trench backfill procedures.**
- **Seismic Refraction Investigations, Alameda and Contra Costa Counties, California. Conducted hammer seismic refraction investigations to determine the depth to bedrock and the density of substance material for several sites proposed for development.**

Mr. Godinho has eight years of extensive field experience including sample collection and analysis of air, water, and soil media for preliminary and remedial site investigations. He has also been involved in the collection and reduction of field data for the design of groundwater and soil remediation systems and is familiar with vapor extraction and bioremediation technologies. Mr. Godinho has been responsible for coordinating excavations, drilling, and construction services. He has interacted with regulatory agencies to ensure compliance with federal, state, and local guidelines. A gas chromatography laboratory supervisor for an environmental firm, Mr. Godinho was responsible for quality assurance and quality control and instrumentation maintenance. Specific project experience includes the following:

Site Remediation

- Coordinate field activities including excavations, drilling, and construction.
- Confirmatory soil sample collection and handling during mass excavation of impacted soils.
- Worked closely with engineers in collecting and reduction of field data for design of groundwater and soil remediation systems.
- Quarterly groundwater monitoring sample collection and handling.
- Implementation and maintenance of remediation systems involving latest technology.

Site Investigations

- Assisted geologists and engineers in Level I Environmental Surveys, preliminary and remedial site investigation, on-site evaluation, development and implementation of remediation efforts.
- Responsible for sample scheduling, logging of all samples into the GC laboratory.
- Perform contamination site monitoring and sample collection in soil, water and air media.

Certification:
40 hour OSHA Regulation 29
CFR 1910.120
CPR and First Aid Certified

Education:
Fresno City College; Fresno, California, Coursework in Business Administration, Marketing Emphasis
American River College; Sacramento, California Coursework in Chemistry

MICHAEL S. GODINHO
Environmental Technician

ESTELLE N. SHIROMA

Environmental Scientist

Education:

University of California
Los Angeles, Doctoral
Candidate-Environmental
Science and Engineering
Program (in progress)
University of Hawaii, MS
in Public Health
(Environmental Health
Sciences), 1979
University of Hawaii, BA
in Zoology, 1976

Certification:

Hazardous Waste Health
and Safety, Forty-hour
Training Course

Memberships:

Western Society of
Naturalists
Environmental Science
and Engineering Society
Phi Kappa Phi

**Selected Publications
and Presentations:**

Ms. Shiroma has authored papers on the monitoring of pollutants in wastewater, sewage, and sediment. She has also given presentations on environmental laboratory testing methods and ecological assessment at Superfund sites.

Ms. Shiroma has provided technical and field support in various aspects of hazardous waste site assessments, including groundwater monitoring well installation, soil and water sampling, laboratory and field data evaluation, and the application of federal and state regulatory criteria to site remediation. Ms. Shiroma has applied her background in the biological sciences and public health to projects involving an assessment of human health and environmental effects from exposure to chemicals in soil, groundwater, surface water, and air.

Specific experience includes the following:

- Performed risk assessments using Federal Superfund guidance human health and ecological evaluations, RCRA Facility guidance, and the Department of Health Services' Site Mitigation Decision Tree document. Results of the risk assessments have been used for selecting remedial actions that are protective of human health and the environment and to establish cleanup goals for hazardous waste sites.
- Assisted in an ecological assessment for a major Superfund site in California located in a wetlands environment where endangered species have been identified by Federal and State agencies. The ecological assessment has required the evaluation of extensive biological field data and soil elutriate bioassay analyses.
- Managed project involving preparation of a Preliminary Endangerment Assessment for a wood products manufacturer in northern California in accordance with California Department of Toxic Substances Control interim guidance. The Preliminary Endangerment Assessment included an evaluation of chemical usage, storage, and disposal in historical and current manufacturing processes, regional and site-specific soil and groundwater quality investigations, and a human health and environmental threat assessment.
- Prepared a Risk Management and Prevention Program plan for an industrial pretreatment plant associated with a major baking facility in northern California. Project involved a system safety and reliability review, accident risk minimization evaluation, and a hazard consequence analysis using qualitative methods and the Automated Resource for Chemical Hazard Incident Evaluation (ARCHIE) model.

ESTELLE N. SHIROMA

Page 2

- **Performed numerous preliminary environmental assessments required for real estate property transfers in California and Hawaii. Projects have involved a review of regulatory agency records, historic aerial photographs, property use records, tenant and owner interviews, and site visits.**

Civil Engineer

Education:

University of Washington
M.S. Civil Engineering, 1984
University of Washington
B.S. Civil Engineering, 1982

Registration:

Registered Professional Engineer, Washington
Qualified Asbestos Worker, Washington

Certifications:

Forty-hour Hazardous Waste Site Health and Safety Training Course
Eight-hour Hazardous Waste Site Supervisors Course

Memberships:

American Society of Civil Engineers
Association of Conservation Engineers
Association of Women Environmental Professionals
Expanding Horizons

Ms. Steiner is a civil engineer with over 10 years of experience specializing in environmental engineering with emphasis on hazardous waste management, environmental regulator auditing, pollutant source identification, site investigations, and remedial action evaluations. Ms. Steiner has performed numerous inspections of industrial and military facilities, and municipal wastewater treatment plants throughout the country to evaluate hazardous materials inventory control, handling practices and waste disposal methods, and to provide recommendations for improved hazardous materials management and minimization practices. Ms. Steiner manages projects involving CERCLA, RCRA, NPDES, and SPCO compliance.

Relevant Project Experience

- Managed RI/FS of South Tacoma Field site, a 300-acre Superfund site in Washington. This multi-media RI/FS involves collection of approximately 2,000 samples of surface and subsurface soil, groundwater, surface water, sediment, and wild blackberries. Other components of the RI are air modeling, soil gas survey, geophysical survey, and aquifer testing.
- Managed RWQCB - ordered RI/FS and remedial action of industrial property in Santa Clara, CA. Investigations included groundwater, soil and soil gas for VOCs and metals.
- Managed FS, and remedial action design and implementation for an active industrial site in Union City, CA involving groundwater and soil contaminated with acetone.
- Prepared conceptual design and cost estimates of potential remedial actions for marine sediments contaminated with metals, PAH, and PCBs. Alternatives included dredging, stabilization, and landfilling.
- Prepared hazardous materials and waste technical appendix to the Environmental Impact Statement (as required under NEPA and Washington SEPA) for the Boeing facility expansion at the Everett, WA plant.
- Conducted environmental assessments of all three Kaiser Works in Washington (Mead, Trentwood, and Tacoma) to identify potential financial liabilities under environmental regulations. Assessments included

GLYNDA J. STEINER, P.E.

Page 2

dangerous/hazardous waste, CERCLA, asbestos, PCB, NPDES, air emissions, underground tanks, and solid waste.

- **Managed multi-media sampling and analysis program for industrial site, including groundwater, storm water, soil, and sludge.**
- **Conducted environmental assessments of industrial properties to identify potential financial liabilities under environmental regulations.**
- **Prepared Spill Prevention, Control and Countermeasures (SPCC), hazardous waste management, and other environmental compliance plans for several industrial clients.**
- **Provided technical and management assistance during the Commencement Bay Superfund RI/FS, including evaluation of potential pollutant sources and remedial alternatives; preparation and implementation of sampling and analysis, and QA/QC plans; and development and use of sediment criteria.**
- **Provided hazardous waste management and minimization technical assistance to the governments of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands (CNMI).**
- **Managed project reviewing Feasibility Study for the Commencement Bay (WA) Nearshore/Tideflats Superfund site for a PRP. This project included technical evaluation of Apparent Effects Thresholds (AET) and their use as cleanup goals; participation in a PRP group; performed sensitivity analysis of potential sediment areas using a range of potential cleanup goals; independent evaluation of sediment remedial actions and associated costs; and identification of additional PRPs not named by EPA and Ecology.**
- **Reviewed the Ruston/Vashon Island Field Investigation for PRP to assess completeness and accuracy of data generated and to evaluate the appropriate use of those data in selecting potential remedial actions.**
- **Prepared a comprehensive environmental management plan for a shipbuilding company which addressed regulatory requirements for hazardous and solid waste management, SPCC planning, and NPDES permit.**

STEPHEN E. FOX

Geologist

Education:

University of Idaho, MS in
Geology, 1985
St. Lawrence University, BS
in Geology, 1982

Publications:

Fox, S.E. and Webster, G.D.
1984. "A New Late Devonian
Flexible Crinoid from East-
Central Idaho." Geol. Soc.
America, abstract no. 38581.

Webster, G.D., and Fox, S.E.
1984. "A New Species from
the Lost River Range, East-
Central Idaho." J. of
Paleontology (60(2): 405-
410.

Mr. Fox has a diversified experience base in the hazardous waste site investigation field. His principal areas of project activities have included the designing of groundwater monitoring systems and groundwater extracting systems, and managing remedial investigation studies of industrial sites. He is familiar with local agency requirements as well as state and federal hazardous waste investigation and management. Mr. Fox also has experience in underground tank removal, and soil excavation.

Specific experience includes the following:

- Phase II/III Groundwater Investigation, for a pesticide plant in California's Central Valley. Assisted in the planning and implementation of a 4 month field investigation that included the drilling of five, 250 foot exploration holes for lithologic and geophysical data, the installation of 18 groundwater monitoring wells up to 200 feet below ground surface. Constructed cross-sections summarizing the site and regional stratigraphy and hydrogeology and selected screened intervals for the groundwater monitoring wells based on the interpretations of the cross-sections. Wrote the report summarizing the field investigation and the chemical and hydrogeologic interpretations.
- Soil and Groundwater Investigation for Santa Clara County Transportation Agency's (SCCTA) North Coach Facility, Mountain View, California. Responsible for the subsurface investigations at this bus maintenance facility. Responsibilities included supervising field activities, coordinating the groundwater sampling program, and writing sections of the Remedial Investigation Report for the facility. Designed a groundwater extraction well system to remove floating motor oil and diesel fuel product from the shallow groundwater zone. Disposed of various investigation derived wastes which included drilling mud, soil cuttings, and groundwater produced during drilling and sampling activities.
- Soil and Groundwater Investigation for a former truck assembly facility in Newark, California. Remedial investigation/feasibility study under the guidance of the Regional Water Quality Board (RWQCB). Wrote the workplan for soil and groundwater investigation that was submitted to and approved by both the RWQCB and Alameda County Water District (ACWD). Obtained the permits necessary to perform the field work. Conducted a potential conduit study

STEPHEN E. FOX

Page 2

that identified and closed some former agricultural wells that existed onsite. The wells were identified using geophysical methods and the wells were destroyed by drilling out the wells with a mud rotary drilling rig and cementing the wells to the surface. Responsible for writing the report summarizing the field activities and the closure of the potential conduits.

- Groundwater contamination study, remedial investigation, remedial action plan and risk assessment plan, Santa Clara County, California. Assisted project manager with field work, records review, and data management. Duties involved monitoring well installation, soil borings, monitoring well surveys, and geologic and hydraulic interpretation of a hydrocarbon groundwater contamination problem.
- Soil and groundwater hydrocarbon contamination investigations, California. Investigated soil and groundwater hydrocarbon contamination throughout the San Francisco Bay Area. Duties involved tank closure sampling, monitoring well installation, soil excavation and aeration, data interpretation, report writing, and review and disposal of investigation-derived waste.
- Infiltration basin study, Del Norte Co., California. Participated in the field work and geologic interpretations. Responsible for monitoring well installation, soil sampling, and monitoring well survey.
- Soil and groundwater hydrocarbon and PCB contamination, Livermore Basin, California. Supervised the excavation of contaminated soils, and the eventual disposal of those soils. Responsible for permitting and installation of deep monitoring wells to define the extent of floating product plume, and correlated the water quality data with soil gas surveys conducted onsite.

Kennedy/Jenks Consultants

ROBERT A. RYDER

Senior Sanitary Engineer

Education:

U.C. Berkeley, Graduate
Courses in Chemistry/
Chemical Engineering, 1962
M.I.T., MS in Sanitary
Engineering, 1953
Purdue University, BS in
Civil Engineering, 1951

Registration:

Civil and Chemical Engineer
in California, Washington,
Nevada, Alaska, Hawaii,
and Indiana

Memberships:

American Academy of
Environmental Engineers
American Society of Civil
Engineers
American Water Works
Association
National Association of
Corrosion Engineers
Water Environment
Federation
International Association of
Water Quality
Tau Beta Pi
Sigma Xi

Mr. Ryder has made significant contributions in evaluating water treatment processes and design of municipal and industrial water treatment facilities throughout North and South America. While with Kennedy/Jenks Consultants, he has served in a variety of capacities, including project manager, design engineer, and value engineering reviewer on numerous water and waste treatment facilities, water quality studies, and environmental impact reports. He also served as director of the firm's environmental laboratory for 15 years.

Extensive experience in potable water treatment has included planning, design, and operations assistance in over a hundred water treatment facilities ranging from 10-gpm to 800-mgd capacity. These have included both surface and groundwater sources with removal requirements, including bacteria, turbidity, color, taste and odors, iron, manganese, asbestos, THM, *Giardia*, sulfides, arsenic, fluoride, salinity, VOC, SOC, and pesticide removal.

Mr. Ryder has extensive experience in pilot plant testing and process evaluation studies, including a number of projects involving sludge thickening, dewatering, and disposal, as well as waste filter backwash clarification and recovery. He also has conducted pilot plant tests for water reclamation, metals reduction, oil removal and corrosion control.

He has conducted numerous water quality, watershed studies, sanitary surveys, and environmental impact reports. This work has included river basin studies of the Spokane, Truckee, Lower Colorado and Mad rivers and estuarine studies of San Francisco, Humboldt and Monterey bays, Puget Sound, Pearl and Pago Pago harbors. He has participated in a number of watershed surveys and management plans, including work for the Hawaiian Sugar Planter Association, Humboldt Bay Water District, U.S. Navy at Guam and Subic Bay. Mr. Ryder developed oil dispersant effectiveness and toxicity test procedures for the EPA following the Santa Barbara Oil Spill, and subsequently tested many commercial oil dispersant products to qualify for their environmental use.

Specific project experience as design/process engineer or technical consultant includes:

- Greater Vancouver Regional District - Water Quality Plan
- City of Seattle - Corrosion Control and Turbidity Reduction of unfiltered Tolt and Cedar River water supplies

ROBERT A. RYDER

Page 2

- Humboldt Bay Municipal Utilities District - Water Supply, Pumping, Transmission Planning - Planning and Design and Forest Brush Control Management Water Quality Control Evaluation
- Shelter Cove - Water Supply Master Plan - Stream Diversion, Treatment, Storage, and Distribution
- Guam - Fena Reservoir - Water Quality Management Plan
- Palmira, Colombia - Water Supply Master
- Asuncion, Paraguay - Water Supply Master Plan and Water Treatment and Pumping Improvements
- Santa Clara Valley Water District - Water Quality and Treatment Planning and South Bay Aqueduct
- Yountville - Water Supply Plan and Rate Study
- City of Calistoga - Water Supply Master Plan
- City of Hollister - Water Quality Cost Evaluation of San Felipe
- Santa Nella Water District - Water Supply Master Plan
- El Dorado Irrigation District - Water Quality and Watershed Management Study of South Fork of American River, Weber Creek and Cosumnes River
- Citizens Utilities Company of California - Watershed Management Plan for Felton and Montara Surface Water Treatment Plants
- South Truckee Meadows - Water Supply Plan
- Lassen County - Honey Lake Basin Water Management
- Sierra Reflections - Water Supply
- Hawthorne, Nevada - Whiskey Flat Water Supply Plan
- Washoe Valley - Water Supply Management Plan
- Verdi Meadows - Water Supply Plan
- Glen Canyon Dam, U.S. Bureau of Reclamation - Water Supply and Treatment
- Marin Municipal Water District - Water Reclamation
- Yosemite Lakes, Madera County - Water Supply and Wastewater Master Plan
- Ingomar Agricultural Industrial Park, Merced County - Wastewater Management and Selenium Control Plan
- Aromas County Water District - Water Supply Master Plan - groundwater development and treatment
- Coastside County Water District, Half Moon Bay - Water Supply Master Plan and Water Treatment
- U. C. Davis and U.C. Santa Cruz - Water Supply Master Plans - development and storage

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