CH2M HILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833
Tel 916-920-0300
Fax 916-920-8463

December 20, 2010

382914

Mr. Craig Hoffman
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: Mariposa Energy Project (09-AFC-03)
Applicant's Testimony

Dear Mr. Hoffman:

Attached please find 1 hard copy and 1 electronic copy on CD-ROM of the Mariposa Energy Project Applicant's Testimony.

If you have any questions about this matter, please contact me at (916) 286-0348.

Sincerely,

CH2M HILL

Doug Urry
AFC Project Manager

Attachment
cc: C. Curry, Mariposa Energy, LLC.
B. Buchynsky, Mariposa Energy, LLC.

Mariposa Energy Project

(09-AFC-03)

Applicant's Testimony

Submitted to

California Energy Commission

Submitted by

Mariposa Energy, LLC

With Assistance from

CH2MHILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833

December 2010

Contents

Section **Page**

Project Description 1
Electrical Transmission 9
Air Quality and Greenhouse Gas Emissions 13
Biological Resources 25
Cultural Resources 35
Geological Resources 41
Hazardous Materials Handling 45
Land Use 51
Noise and Vibration 57
Paleontological Resources 61
Public Health 63
Socioeconomics 67
Soils 71
Traffic and Transportation 77
Traffic and Transportation—Aviation 81
Visual Resources 91
Waste Management 95
Water Resources 99
Worker Health and Safety 105
Alternatives 109

Appendixes

A Resumes
B Signed Declarations

Project Description

I. Introduction

A. Name: Doug Urry, Gary Normoyle

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 2.0 Project Description; Volume 2, Appendix 2A Design Criteria, Appendix 2B Heat and Mass Balance Calculations, Appendix 2C Preliminary Geotechnical Report, Appendix 2D BBID Will Serve Letter, Appendix 2E PG&E Will Serve Letter, dated June 15, 2009 [Exhibit 1].
- Supplement A, Data Adequacy, Project Description, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B Additional Laydown Area Analysis, Project Description, dated March 5, 2010 [Exhibit 6].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].
- Project Description Update for Proposed Water Supply and Natural Gas Pipelines, dated December 1, 2010 [Exhibit 64].
- Project Description Update, Water Conservation Program, dated December 9, 2010 [Exhibit 66].

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Summary

MEP will be a nominal 200-megawatt (MW) peaking facility consisting of four General Electric (GE) LM6000 PC-Sprint natural gas-fired combustion turbine generators (CTG) and associated equipment. The project consists of construction of new generation as well as connection to natural gas, water, and electrical transmission interties.

The facility will be located southeast of the intersection of Bruns Road and Kelso Road on a 10-acre portion of a 158-acre parcel immediately south of the Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and 230-kV Kelso Substation. The proposed power plant site is located in the southern portion of the parcel, between two small hills.

The project site is in northeastern Alameda County, in an unincorporated area designated for Large Parcel Agriculture by the East County Area Plan. The Assessor's parcel number is 099B-7050-001-10. Access is via an access road that runs east from Bruns Road to the MEP site, within the parcel.

The 6.5-MW Byron Power Cogen Plant currently occupies 2 acres of the 158-acre parcel. The remainder of the parcel is non-irrigated grazing land. There was prior wind turbine development on the project site and the southern portion of the parcel. Minor debris from that development remains on site.

The project is expected operate 600 hours per year on average, but will be permitted to run up to a maximum of 4,000 hours per year. Primary equipment for the generating facility will include four General Electric (GE) LM6000 PC-Sprint natural gas-fired combustion turbine generators (CTG) and associated equipment. Power will be transmitted to the grid at 230-kV through a new 0.7-mile transmission line that will connect to the existing Kelso Substation. A new 580-foot 8 inch diameter natural gas pipeline will interconnect the project to PG&E's Line 2, which is an existing high-pressure natural gas pipeline located northeast of the project site, on the same 158-acre parcel. Service and process water will be raw water provided from a new connection to the Byron-Bethany Irrigation District (BBID) via a new pump station and 1.8-mile pipeline.

MEP will utilize 35 acre-feet of water per year based on the expected operating scenario of 600 hours per year, and 200 starts/stops. In the event of maximum permitted annual operation, MEP will utilize 187 acre-feet of water for 4,000 hours of operation and 300 starts/stops. Stormwater runoff from non-process areas will be detained on-site in an extended detention basin and released according to regulatory standards for stormwater quality control. Storm water entering plant drains that potentially could contain oil or grease will be routed through an oil/water separator and recycled for process use. All domestic wastewater will be routed to an on-site septic system tank and removed via truck for off-site disposal.

Air emissions control systems will include a selective catalytic reduction (SCR) system for nitrogen oxides (NOx) control using 19-percent aqueous ammonia and an oxidation catalyst for carbon monoxide (CO) control.

Temporary construction facilities will include a 9.2-acre worker parking and laydown area immediately east of the project site, a 1-acre water supply pipeline parking and laydown area located at the Byron-Bethany Irrigation District (BBID) headquarters facility, to serve water pipeline construction needs, and a 0.6-acre laydown area along the transmission line route.

The project will have the following design features:

- Four GE LM6000 PC Sprint combustion turbine generators CTGs and associated support equipment.
- Air emissions control systems including SCR systems for NOx control and oxidation catalyst for CO control.

- A new, approximately 0.7-mile-long, 230-kV transmission line to deliver the plant output to the electrical grid via the existing 230-kV Kelso Substation located north of the project site.
- Approximately 580 feet of new 8-inch-diameter natural gas pipeline that will run directly northeast from the project site to interconnect with PG&E's existing high pressure natural gas pipeline.
- A new 10-inch-diameter, 1.8-mile water supply line from BBID Canal 45.

B. Major Electrical Equipment and Systems

This section describes MEP's major electrical equipment and systems.

AC Power- Transmission

Power will be generated by the four CTGs at 13.8 kV and then stepped up using four 13.8/230-kV, oil-filled generator step-up transformers, to support connection to the local 230-kV network. Surge arrestors protect the transformer from surges in the 230-kV system caused by lightning strikes or other system disturbances. The transformers will be set on a concrete foundation that includes a secondary oil containment reservoir to contain the transformer oil in the event of a leak or spill. The high-voltage side of the generator step-up transformer will be connected to a 0.7-mile single-circuit, three-phase, 230-kV transmission line, which will be connected to the PG&E 230-kV switchyard at the Kelso Substation located north of the MEP site on Bruns Road.

AC Power- Distribution to Auxiliaries

Auxiliary power will be supplied at 4,160 volts and 480 volts through a double-ended, 4,160-volt switchgear lineup and a double-ended, 480-volt switchgear lineup. Each 13.8/4.16-kV unit auxiliary transformer will supply primary power to the medium-voltage switchgear and the corresponding medium-voltage motor control center (MCC). The unit auxiliary transformer primary (13.8 kV) will be connected to the 15-kV switchgear lineup on the low-voltage side of one of the generator step-up transformers. This interface point allows the switchgear to be backfed from the local grid when the CTGs are not running, or directly from the CTGs when they are in operation. Each CTG will have a 15-kV rated breaker between the generator and the generator step-up transformer for generator synchronization and isolation.

The 4,160-volt switchgear/MCC lineup supplies power to all medium-voltage loads as well as the two station service transformers, rated 4,160/480 volts, for 480-volt power distribution. Each station service transformer will be oil-filled and sized to supply 480-volt, 3-phase power to the plant 480-volt MCCs. The MCCs will provide power to the 480-volt motor loads as well as other low-voltage plant loads.

125-Volt DC Power Supply System

One common 125-volt DC power supply system consisting of one 100-percent-capacity battery bank, two 100-percent static battery chargers, a switchboard, and two or more distribution panels will be supplied for the balance-of-plant and essential CTG equipment. Each CTG will be provided with its own separate battery systems and redundant chargers.

Under normal operating conditions, the battery chargers supply DC power to the DC loads. The battery chargers are fed by 480-volt AC (VAC) and continuously charge the battery banks while supplying power to the DC loads.

Under abnormal or emergency conditions, when power from the AC power supply (480-volt) system is unavailable, the batteries supply DC power to the DC system loads. Recharging of a discharged battery occurs whenever 480-volt power becomes available from the AC power supply system. The rate of charge depends on the characteristics of the battery, battery charger, and the connected DC load during charging. The anticipated maximum recharge time will be 12 hours.

The 125-volt DC system will also be used to provide control power to the 4,160-volt switchgear, the 480-volt load centers, critical control circuits, the plant control system, and the emergency DC motors.

Uninterruptible Power Supply System

The CTGs and power block will have an essential service 120-VAC, single-phase, 60-Hz uninterruptible power supply (UPS) supplying power to essential instrumentation, critical equipment loads, and unit protection and safety systems that require uninterrupted AC power.

C. Fuel System

The CTGs will be designed to burn natural gas only. The natural gas requirement during base load operation at annual average ambient temperature is approximately 1,926 million British thermal units per hour (MMBtu/hr) (higher heat value [HHV] basis, total for four CTG units), or 44.9 million dry standard cubic feet. Seasonal temperature fluctuations do not significantly influence fuel demand because the inlet combustion air temperature will be reduced by inlet air chillers as necessary to optimize efficiency.

Natural gas will be delivered to the site via a tap off an existing PG&E natural gas pipeline (Line 2) located approximately 580 feet east of MEP on the same parcel. The new gas supply piping will consist of an 8-inch-diameter pipeline. At the plant site, the natural gas will flow through an 8-inch turbine-meter set, gas scrubber/filtering equipment, a gas pressure control station, electric-driven booster compressors coalescing and final fuel filters, and a fuel gas heater prior to entering the combustion turbines.

A minimum floating delivery pressure of 350 pounds per square inch gauge, as measured downstream of a non-regulated meter set, will be provided by PG&E. Five 25%-percent-total plant capacity, electric-driven fuel gas compressors will be provided to boost the pressure to that required by the CTGs. The gas compressors will be located outdoors and will be surrounded by acoustical barriers to reduce the compressor noise level.

D. Inlet Air Chiller System

Combustion air will be maintained at an optimum inlet temperature through the use of air-cooled inlet air chillers. Two chiller packages will be provided, sized to serve the four CTGs.

The air chillers will cool water, which is circulated through coils in the CTG inlet air filter housing.

The Applicant has elected to use R134A as the chiller refrigerant working fluid. While this refrigerant has a reduced operating efficiency compared with anhydrous ammonia, it was selected to minimize the transportation, storage, and use of hazardous materials in association with the project. The refrigerant is circulated through the shell side of a shell and tube heat exchanger, where it removes heat from the chilled water system before flowing to a compressor. The compressor pumps the fluid through an air-cooled heat exchanger, where the heat is rejected to the atmosphere. The cooled refrigerant is returned to the shell and tube heat exchanger.

E. Water Supply and Use

MEP will use water supplied by BBID via a new 10-inch-diameter, 1.8-mile-long water supply pipeline. This source will also provide water for fire protection, service water, potable water, safety showers, and sanitary uses. Raw supply water from BBID will be used for service water, chiller fill and make-up, and for fire protection. Potable water will be provided via a tie from the BBID supply pipeline that will be disinfected for safety showers, eye-wash stations, drinking water, and sanitary facilities. Plant drains will collect area washdown, sample drains, and drainage from facility equipment areas. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and will be routed to the wastewater collection system. Drains that potentially could contain oil or grease will first be routed through an oil/water separator. Wastewater from occasional combustion turbine water washes will be collected in a water wash drains tank. The wastewater will be discharged to the existing oil/water separator, where oil waste will be collected to drums and hauled offsite via a licensed waste hauler.

F. Wastewater Management

MEP has been designed as a zero-liquid-discharge (ZLD) facility. Process wastewater will be either recycled or removed for offsite disposal. The primary wastewater collection system will collect process wastewater and stormwater runoff from all of the plant equipment areas and route it to sumps and the onsite oil/water separator before treating the water by an activated carbon filtration ZLD system and recycling it within the plant process water system. Non-process area stormwater will be routed to an onsite extended detention basin with multi-stage discharge structure.

The secondary wastewater collection system will collect sanitary wastewater from sinks, toilets, showers, and other sanitary facilities, and route it to an onsite septic tank for removal by a licensed waste hauler for offsite treatment

Wastewater from infrequent combustion turbine water washes and from the fuel filtration skid(s) will be collected in holding tanks or sumps and will be trucked offsite for disposal at an approved wastewater disposal facility.

G. Facility Reliability

The facility will be designed to operate between about 12.5 percent (50 percent of one of four turbines) and 100 percent of base load, or nominally 25 MW to 200 MW, to support dispatch service in response to customer demands for electricity.

MEP will be designed for an operating life of 40 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life of plant components.

Facility Availability

The percent of time that the simple-cycle power plant is projected to be operated is defined as the "service factor." The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. The projected service factor for the simple-cycle power block, which considers projected percent of time of operation, differs from the equivalent availability factor (EAF), which considers the projected percent of energy production capacity achievable.

The EAF may be defined as a weighted average of the percent of full energy production capacity achievable. The projected equivalent availability factor for MEP is estimated to be approximately 92 to 98 percent.

The EAF, which is a weighted average of the percent of energy production capacity achievable, differs from the "availability of a unit," which is the percent of time that a unit is available for operation, whether at full load, partial load, or on standby.

Redundancy of Critical Components

A summary of equipment redundancy is shown below.

Major Equipment Redundancy at MEP

Description	Number
Simple-cycle CTGs	Four
Fuel gas booster compressors	Five—25-percent of total plant capacity
Demineralizer system	Two—100-percent capacity
Zero liquid discharge (ZLD) system	One—100-percent capacity
Inlet air chiller	Two—100 percent capacity

The major components of the plant process consist of the following subsystems.

Combustion Turbine Generator Subsystems

The combustion turbine subsystems include the combustion turbine, inlet air filtration, chiller coils, generator and excitation systems, turbine lube oil system, hydraulic system, and turbine control and instrumentation. The combustion turbine will produce thermal energy through the combustion of natural gas and the conversion of the thermal energy into mechanical energy through rotation of the combustion turbine that drives the compressor and generator.

The generator is air cooled. The generator excitation system will be a solid-state static system. Combustion turbine control and instrumentation (interfaced with the Distributed Control System [DCS]) will cover the turbine governing system, and the protective system.

The plant power generation process is served by the following balance-of-plant systems.

Distributed Control System

The DCS will be a microprocessor-based system that will provide the following functions:

- Control each CTG via its dedicated Turbine Control System and other systems in response to unit load demands (coordinated control)
- Provide control room operator interface
- Monitor plant equipment and process parameters and provide this information to the plant operators in a meaningful format
- Provide visual and audible alarms for abnormal events based on field signals or software-generated signals from plant systems, processes, or equipment

The DCS will have functionally distributed architecture comprising a group of similar redundant processing units linked to a group of operator consoles and an engineer workstation by redundant data highways. Each processor will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes.

Plant operation will be controlled from the operator panel located in the control room. The operator panel will consist of two individual video/keyboard consoles. Each video/keyboard console will be an independent electronic package so that failure of a single package does not disable more than one video/keyboard.

Demineralized Water System

The demineralized water system will consist of two, 100-percent trailer-mounted water mixed bed demineralizers for an onsite water treatment system consisting of cartridge filtration and mixed bed ion-exchange. Two 100-percent-capacity horizontal centrifugal demineralized water transfer pumps will provide water to the demineralized water treatment system. Demineralized water will be stored in a 380,000-gallon demineralized water storage tank.

Two 100-percent-capacity horizontal centrifugal demineralized water transfer pumps will provide water to the SPRINT and water injection systems as well as to the water wash system.

Service Water Storage

A combined service water/fire protection water storage tank will store 520,000 gallons of water from BBID. Fire water pumps will take suction from the bottom portion of the tank. The tank will contain a stand pipe, and service water transfer pumps will take suction from above the required fire water storage volume.

Two 100-percent capacity service water transfer pumps will provide fill and makeup water to the air-cooled chillers and will supply the truck-mounted water demineralizers.

Compressed Air

The compressed air system provides instrument air and service air to points of use throughout the facility. The compressed air system will include two 100-percent-capacity, motor-driven air compressors; two 100-percent capacity air dryers with prefilters and after filters; an air receiver, instrument air header, and service air header. All compressed air will be dried. A control valve will be provided in the service air header to prevent high consumption of service air from reducing the instrument air header pressure below critical levels.

Fuel Availability

Fuel will be delivered via a new 8-inch-diameter pipeline serving the project site. This pipeline will interconnect with PG&E's existing high-pressure natural gas pipeline. It is possible that the connecting line to MEP could become temporarily inoperable due to a breach in the line or from other causes, resulting in fuel not being available at MEP.

Water Availability

MEP will use up to 187 acre–feet per year of water for turbine water injection, compressor water washes and other process uses. Potable water for drinking, safety showers, and sanitary uses will be produced by bag filtration and chlorination of BBID raw water. Fire protection water, service water, and landscape irrigation uses will also be served from BBID.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that 14 Conditions of Certification (COCs) be adopted to address general conditions including compliance monitoring and closure plan issues: COMPLIANCE-1 through COMPLIANCE-14. The Applicant has reviewed the recommended COCs and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Executive Summary, Introduction, Project Description, Facility Design, Power Plant Efficiency, Power Plant Reliability and General Conditions

Electric Transmission

I. Introduction

A. Name: Randy Van Ess

B. **Qualifications:** Mr. Van Ess's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 3 Electric Transmission; Volume 2, Appendix 3A Screening Level Transmission Analysis, dated June 15, 2009 [Exhibit 1].
- Data Adequacy Supplement A, Electrical Transmission, dated July 31, 2009 [Exhibit 5].
- Applicant's Responses to CEC Staff Requests, Data Response Set 1A & 1B, dated November 30, 2009. Responses to Data Requests 56 and 57 [Exhibit 7].
- Applicant's Responses to CEC Staff Requests, Data Response Set 1C, dated February 12, 2010. Response to Data Request 56 [Exhibit 8].
- Applicant's Responses to CEC Staff Requests, Data Response Set 1D, dated March 31, 2010. Response to CEC Staff and Data Request 56 [Exhibit 11].
- Transition Cluster Phase I Interconnection Study, dated September 8, 2009 [Exhibit 23].
- Data Request 56 Response, dated November 9, 2009 [Exhibit 25].
- Notice of Need for Additional Time to Answer Staff Data Requests, dated November 12, 2009 [Exhibit 26].
- Transition Cluster Phase II Interconnection Study Report - Greater Bay Area, dated September 22, 2010 [Exhibit 51].
- Applicant's Comments on the CEC Staff Assessment related to Transmission System Engineering and Transmission Line Safety and Nuisance, dated November 24, 2010 [Exhibit 61].

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

Mariposa Energy Project (MEP) will be located in northeastern Alameda County, on a 10-acre portion of a 158-acre parcel south of the Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and 230-kilovolt (kV) Kelso Substation.

This location was selected, in part, for its proximity to the Kelso Substation, to which MEP will interconnect via a new, approximately 0.7-mile-long, 230-kV transmission line. The existing transmission resources in the vicinity of MEP are owned by PG&E and are part of its service area.

B. Proposed Transmission Interconnection

MEP will be interconnected with the regional electrical grid by a new, approximately 0.7-mile-long, single-circuit, three-phase, 230-kV transmission line. The proposed 230-kV line will run generally north from the project site, staying east of the Byron Power Cogen Plant, crossing Kelso Road, and staying east of the PG&E Bethany Compressor Station. It will turn west just north of the Kelso Substation, then turn south to the final interconnect point at the Kelso Substation.

MEP Switchyard Characteristics

The MEP switchyard will use a single 230-kV circuit breaker for the four generating units and a generator step-up transformer for each generating unit. The main buses, as well as the bays, will be designed to carry at least 1200 amperes on a continuous basis.

Startup and standby power will be supplied through the generator step-up transformers and the auxiliary transformers. Auxiliary controls and protective relay systems for the MEP switchyard will be located in the power plant power distribution center.

PG&E Transmission Line Reconductoring

The Transition Cluster Phase I and Phase II Study Interconnection Study Reports identified a large number of new potential overloads on the downstream transmission facilities due to the addition of the 6 projects. MEP will have significant responsibility for two identified overloads that will require reconductoring. The two segments are the Kelso–Tesla 230-kV line (Kelso-USWP Ralph), which is approximately 3.3 miles long, and the Kelso–Tesla 230-kV line (USWP Ralph–Tesla), which is approximately 4.7 miles long. The total length of the lines to be reconductored is approximately 8 miles. The lines would be reconductored with a high capacity conductor. Substation terminal equipment will also be upgraded to match or exceed the ampacity ratings of the new conductors. The Project includes a total of 39 existing towers. Tower modifications and excavation work near the towers are not anticipated at this time.

C. Transmission Interconnection System Impact Study and Facility Study Reports

Phase I and Phase II System Impact Study Reports have been completed for MEP. As discussed above, interconnection of MEP requires that the existing 3.3 mile long Kelso–Tesla 230-kV (Kelso–USWP Ralph) transmission line and 4.7 mile long Kelso-Tesla 230-kV (USWP

Ralph-Tesla) transmission line be reconductored to prevent overloading of the transmission lines.

D. Transmission System Safety and Nuisances

This section discusses safety and nuisance issues associated with MEP's proposed electrical interconnection.

Electrical Clearances

Typical high-voltage overhead transmission lines are composed of bare conductors connected to supporting structures by means of porcelain, glass, or plastic insulators. The air surrounding the energized conductor acts as the insulating medium. Maintaining sufficient clearances, or air space, around the conductors to protect the public and utility workers is paramount to the safe operation of the line. The required safety clearance required for the conductors is determined by considering factors such as the normal operating voltages, conductor temperatures, short-term abnormal voltages, windblown swinging conductors, contamination of the insulators, clearances for workers, and clearances for public safety.

MEP's transmission line will conform to the minimum clearances specified in the California Public Utilities Commission (CPUC) General Order 95 (GO 95).

Electric and Magnetic Fields and Audible Noise

The AFC discusses in detail the Electrical Effects, Magnetic Fields, and Audible Noise issues. This testimony will only reiterate the conclusions. The discussions in the AFC are incorporated by reference.

Transmission Line EMF Reduction

While the State of California does not set a statutory limit for electric and magnetic field levels, the CPUC, which regulates electric transmission lines, mandates EMF reduction as a practicable design criterion for new and upgraded electrical facilities. As a result of this mandate, the regulated electric utilities have developed their own design guidelines to reduce EMF at each new facility. The CEC, which regulates transmission lines to the first point of connection, requires generators to follow the existing guidelines that are in use by local electric utilities or transmission-system owners.

EMF and Audible Noise Conclusions

Construction and operation of MEP, including the interconnection of the facility with PG&E's transmission system, are not expected to result in significant increases in EMF levels, corona, audible noise, or radio and television interference.

E. Cumulative Impacts

Compliance with LORS and codes in the design of MEP will not create any significant adverse cumulative impacts.

F. Mitigation

There are no significant adverse impacts and the project is in compliance with all applicable laws, ordinances, regulations, and standards. As such no additional mitigation is required.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) recommends that seven Conditions of Certification (COCs) be adopted to address transmission system engineering (TSE) issues, TSE-1 through TSE-7 of the SSA. The Applicant has reviewed the Conditions of Certification (TSE-1 to TSE-7) set forth in the SSA and finds them acceptable.

The SSA for the project filed by the CEC recommends that four COCs be adopted to address transmission line safety and nuisance (TLSN) issues, TLSN-1 through TLSN-4. The Applicant has reviewed the Conditions of Certification (TLSN-1 to TLSN-4) set forth in the SSA and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Transmission Line Safety and Nuisance
- Transmission System Engineering

Air Quality and Greenhouse Gas Emissions

I. Introduction

A. Name: Jerry Salamy and Keith McGregor

B. Qualifications: The qualifications of the authors are noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification (AFC), Volume 1, Section 5.1 Air Quality; Volume 2, Appendix 5.1, Construction Emission Estimates, dated June 15, 2009 [Exhibit 1].
- AFC Air Quality Dispersion Modeling and Health Risk Assessment Files, dated June 15, 2009 [Exhibit 2].
- Supplement A, Data Adequacy, Air Quality, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.1 Air Quality, dated March 5, 2010 [Exhibit 6].
- Data Response Sets 1A & 1B, Responses to CEC Staff Data Requests 1 through 14, dated November 30, 2009 [Exhibit 7].
- Data Response Set 1C, Responses to CEC Staff, Data Requests 2, 5, 8, & 9, dated February 12, 2010 [Exhibit 8].
- Robert Sarvey Data Response Set 1, Data Requests 1 through 3, dated February 18, 2010 [Exhibit 9].
- Applicant's Data Response Set 1D, Response to CEC Staff & Data Request 56, dated March 31, 2010 [Exhibit 11].
- Applicant's R. Dighe Data Response Set 2, Responses to Dighe Data Request 11, dated May 4, 2010 [Exhibit 13].
- CH2M HILL'S R. Sarvey Data Response Set 2, Response to 12 through 31, dated May 12, 2010 [Exhibit 14].
- Letter to A. Soloman, Notice of Completion of the Preliminary Review of the Determination of Compliance / Authority to Construct Application, dated August 10, 2009 [Exhibit 21].
- CEC Response to Application for Confidentiality - Emission Reduction Credits, dated September 3, 2009 [Exhibit 22].

- Additional Modeling Files Submitted to the BAAQMD for Comparison to the New Federal 1-hour NO_2 Standard, dated March 22, 2010 [Exhibit 33].
- Applicant's Objections to Robert Sarvey Data Request Set 2, dated April 2, 2010 [Exhibit 34].
- Mariposa Energy, LLC Letter to CEC re MHCSD Resolution R-MMX-4 Opposing the Project, dated April 8, 2010 [Exhibit 37].
- Preliminary Determination of Compliance, dated August 18, 2010 [Exhibit 46].
- Applicant's Preliminary Determination of Compliance, dated September 27, 2010 [Exhibit 52].
- Applicant's Response to Public Comments Received on Preliminary Determination of Compliance, dated October 19, 2010 [Exhibit 57].
- Applicant's Response to Public Comments Received on Mariposa PDOC, dated November 4, 2010 [Exhibit 59].
- Applicant's Comments on the Staff Assessment, dated November 24, 2010 [Exhibit 61].
- BAAQMD Final Determination of Compliance, dated November 24, 2010 [Exhibit 62].
- Applicant's Responses to Staff Assessment Workshop Request for Data, dated December 7, 2010 [Exhibit 65].

D. Submitted With a Request for Confidential Treatment:

- Application for Confidential Designation - Emission Reduction Credits (Attachment DA 5.1-2), dated August 3, 2009.

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

Operation of the Mariposa Energy Project's (MEP or project) natural-gas-fired simple-cycle turbines and diesel-fired emergency fire pump engine will result in emissions of criteria pollutants and greenhouse gases. However, the potential emissions have been minimized as part of the turbine selection process and the implementation of best available control technology, as defined by the Bay Area Air Quality Management District (BAAQMD). The air quality impacts of the project were evaluated and shown to satisfy all state and federal air quality requirements. This conclusion was confirmed, after extensive review by the BAAQMD, in the Final Determination of Compliance (FDOC) issued on November 24, 2010. The non-attainment criteria pollutant (and pre-cursor) emissions will also be mitigated through the BAAQMD emission reduction credit (ERC) program and a mitigation agreement between the

Applicant and the San Joaquin Valley Air Pollution Control District (SJVAPCD). Therefore, MEP will comply with all applicable federal, state, and local air quality LORS and meet the mitigation policies established by the CEC.

A. Affected Environment

Project Location

The project will be located on a 10-acre portion of a 158-acre parcel southeast of the intersection of Bruns Road and Kelso Road, in northeastern Alameda County. Based on the Environmental Data Resources (EDR) *Offsite Receptor Report*[1], approximately 9,900 residents live within a 6-mile radius of MEP. The nearest sensitive receptor is the Mountain House School at 3950 Mountain House Road, located approximately 1.3 miles to the east of the project site. The nearest resident is approximately 0.6 miles northeast of the facility along Kelso Road. The nearest business, the Byron Power Company Cogeneration Plant, is less than 0.1 mile due north of the site on the same parcel.

The potential air quality environmental impacts were evaluated based on BAAQMD permitting rules and regulations because the project will be located within the jurisdictional boundaries of the BAAQMD. However, because the project also borders the San Joaquin Valley Air Basin (SJVAB), the Applicant worked cooperatively with the SJVAPCD to achieve mitigation consistent with other projects licensed in eastern Alameda County.

Existing Air Quality

The three ambient air monitoring stations used to characterize air quality at the project site were the Tracy Airport, Bethel Island, and Stockton – Hazelton Avenue monitoring stations. These stations were chosen based on their proximity to the project site and in consultation with BAAQMD. For instance, the Stockton-Hazelton Avenue monitoring station was considered more representative than the Livermore monitoring station based on comments received from BAAQMD even though the Livermore station is closer to MEP. All ambient air quality data were based on data published by the California Air Resources Board (ARB), BAAQMD, and United States Environmental Protection Agency (EPA). The maximum ambient background concentrations from the previous three years were combined with the modeled concentrations and used for comparison to the ambient air quality standards (AAQS). The distance from MEP to each of the monitoring stations and the location of the monitoring station relative to MEP are presented in Table 1.

TABLE 1
Ambient Air Monitoring Station Locations

Pollutant	Pollutants Recorded	Distance from Project Site
Tracy Airport	Ozone, NO_2, PM_{10}, $PM_{2.5}$	12 miles southeast of MEP
Bethel Island	Ozone, NO_2, PM_{10}, CO, SO_2	16 miles northwest of MEP
Stockton – Hazelton Avenue	Ozone, NO_2, PM_{10}, $PM_{2.5}$, CO	18 miles northeast of MEP

[1] Environmental Data Resources (EDR). 2009. EDR Offsite Receptor Report. March 24.

The EPA and ARB have each established ambient air quality standards to protect public health and welfare. Both state and national ambient air quality standards consist of two parts: an allowable concentration of a pollutant and an averaging time over which the concentration is to be measured. Allowable concentrations are based on the results of studies of the effects of pollutants on human health, crops, and vegetation. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposures to a high concentration for a short time (one hour, for instance) or to a relatively lower average concentration over a longer period. Air quality standards have been set for ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate sulfates, respirable particulate matter less than 10 micron in diameter (PM_{10}), and fine particulate matter less than 2.5 micron in diameter ($PM_{2.5}$).

The EPA and ARB have classified areas in California as attainment or non-attainment with respect to each criteria pollutant, depending on whether the area meets the federal and state standards. The federal and state attainment status for the BAAQMD are presented in Table 2.

TABLE 2
State and Federal Air Quality Designations for the BAAQMD (Website Accessed December 2010[2])

Pollutant	State Designation	Federal Designation
Ozone	1-Hour: Non-attainment 8-Hour: Non-attainment	1-Hour: Not Applicable 8-Hour: Non-attainment [a]
CO	1-Hour: Attainment 8-Hour: Attainment	1-Hour: Attainment 8-Hour: Attainment
NO_2	1-Hour: Attainment	1-Hour:Unclassified[b] Annual: Attainment
SO_2	1-Hour: Attainment 24-Hour: Attainment	24-Hour: Attainment[c]
PM_{10}	24-Hour: Non-attainment Annual: Non-attainment	24-Hour: Unclassified
$PM_{2.5}$	Annual: Non-attainment	24-Hour: Non-attainment [d] Annual: Attainment
Lead, H_2S, and Sulfates	Attainment, Unclassified, Attainment	Attainment, No federal standard, No federal standard

[a]EPA lowered the national 8-hour ozone standard from 0.80 to 0.75 ppm effective May 27, 2008. EPA will issue final designations based on the new 0.75 ppm ozone standard by March 2011[3].

[b] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

[c]On June 2, 2010, the EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The EPA also revoked both the existing 24-hour SO_2 standard of the 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm (effective August 23, 2010).

[d]EPA has designated the Bay Area as non-attainment for the 24-hour $PM_{2.5}$ NAAQS, effective December 2009.

[2] BAAQMD. 2010. Ambient Air Quality Standards and Bay Area Attainment Designations. http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm. Accessed December.

[3] EPA. 2010. Extension of Deadline for Promulgating Designations for the 2008 Ozone National Ambient Air Quality Standards, Fact Sheet. www.epa.gov/ozonedesignations. Accessed December.

B. Criteria Pollutant Emissions Associated with the Proposed Facility

Construction Emissions

Criteria pollutants will be generated during the installation of the four new combustion turbines, the new auxiliary equipment, and the administration buildings. The construction area is expected to be approximately 20 acres, which includes approximately 9.2 acres for laydown and parking. Most of the construction activities are expected to be completed within 10 months of the 14-month construction phase. The remaining construction period will be used for contractor mobilization, turbine commissioning activities, and contractor demobilization. Emissions were calculated for construction equipment exhaust, on- and offsite motor vehicle exhaust, re-entrained road dust, and fugitive dust emissions from soil disturbance. Daily, annual, and total project emission estimates were based on emission factors developed by the EPA and ARB.

Commissioning Emissions

During the commissioning phase, the turbines will be operated at various load rates to ensure proper operation of the equipment without the benefit of the emission control systems. As discussed in the BAAQMD Best Available Control Technology (BACT) analysis, the only control technology available for limiting emissions during the commissioning period is to use best work practices to minimize emissions as much as possible and to expedite the commissioning process so that compliance with the more stringent BACT emission limits for normal operations can be achieved as quickly as possible. Therefore, the Applicant will ensure that emissions are reduced to the extent feasible by limiting equipment operation consistent with the equipment manufacturer's recommended intervals with a maximum commissioning duration of 200 hours for each turbine (Condition of Certification AQ-7). The Applicant will also be required to submit a commissioning plan for approval by BAAQMD and the CEC Compliance Project Manager (CPM) prior to first fire of the turbines. The intent of this plan is to further reduce commissioning emission impacts.

Operational Emissions

The proposed facility will generate electric power for the grid using the GE LM6000 PC Sprint simple-cycle combustion turbines. The combustion turbines will generate power by burning natural gas exclusively. As a peaking power plant, MEP will be used by Pacific Gas and Electric (PG&E) to maintain grid stability through dispatch orders from the California Independent System Operator. As such, the facility will be licensed to meet the contractual requirements of the PG&E Power Purchase Agreement which includes up to 4,000 hours of operation per year per turbine (46 percent of the year) plus 300 startup and shutdown cycles. However, as a peaking power plant, the actual capacity is expected to be less. Therefore, in addition to quantifying the potential to emit emissions based on 4,000 hour of operation and 300 startup and shutdown cycles, we estimated the expected emissions based on 600 hours of operation and 200 startup and shutdown cycles. CEC Staff have also conducted a similar emission estimate based on 1,400 hours of operation and 300 startup and shutdown cycles (SA Page 4.1-21).

The project has been designed to use an air-cooled condenser to reject the heat from the turbine inlet air cooling process. Therefore, the project will not require the use of a cooling tower or wet surface air cooler, which eliminates the potential for particulate emissions associated with evaporative cooling tower drift.

The fire protection system will be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The fire water supply and pumping system will provide fire-fighting water using a backup diesel fire pump driver rated at 220 horsepower or less. The diesel fire pump operation will be limited to 50 hours per year for maintenance and testing activities.

Emission estimates for these sources were based on vendor data and a BACT determination conducted by the BAAQMD. Consistent with the BAAQMD's BACT guidelines, control options were evaluated to determine if the options were technologically feasible and cost effective and whether or not the controls have been successfully achieved in practice at similar facilities. Based on the BAAQMD BACT determination, the turbines will be equipped with advanced combustion controls, combined with SCR, to limit emissions of NO_x to 2.5 parts per million by volume, corrected to 15 percent O_2 (ppmvdc). Advanced combustion controls, combined with the use of an oxidation catalyst, will be used to limit CO and VOC emissions to 2 and 1 ppmvdc, respectively. PM_{10} and SO_2 emissions will be kept to a minimum through the exclusive use of low-sulfur natural gas, inlet air filtration (for particulate matter control), and the oxidation catalyst system. The annual hours of operation and numerical emission limits have been incorporated in Condition of Certification AQ-15a, AQ-15b, AQ-17, AQ-19, and AQ-20.

Startup and shutdown periods are a normal part of the operation of natural gas-fired power plants. However, emissions are greater during startup and shutdown than during steady-state operation. One reason is that during startup and shutdown, the turbines are not operating at full load where they are most efficient. Another reason is that the exhaust temperatures are lower during startup and shutdown compared to steady-state operations. This is important because post-combustion emissions control systems such as the SCR catalyst and oxidation catalyst are designed to function at steady state exhaust temperatures. Therefore, the SCR catalyst and oxidation catalyst will only achieve partial abatement for NO_x, carbon monoxide and precursor organic compounds for a portion of the startup and shutdown period.

Because emissions are greater during startups and shutdowns than during steady-state operation, the BACT limits established for steady-state operations are not technically feasible during these periods. Therefore, BAAQMD has established separate BACT limits for startups and shutdowns. As outlined in the BAAQMD FDOC, the start-up and shutdown events will be limited to 30 minutes and 15 minutes, respectively. BAAQMD has also proposed numerical emissions limits for startups and shutdowns to implement the BACT requirement. The numerical limits have been incorporated as Condition of Certification AQ-18.

C. Potential Air Quality Impacts Associated with the Proposed Facility

Construction, Commissioning, and Operational Impacts Associated with MEP

An ambient air quality impact analysis was conducted to compare maximum predicted ground level impacts associated with MEP to established state and federal AAQS and applicable BAAQMD significance criteria. The analysis was conducted in accordance with federal and local regulatory approved air quality impact analysis guidelines. Cartesian coordinate receptor grids were used to identify the maximum predicted ground-level concentrations out to 10 kilometers (approximately 6 miles), which includes all current and future receptor locations within the Mountain House community. The dispersion modeling meteorological data set was

based on surface meteorological data from the Patterson Pass monitoring station and Oakland upper air data. A modeling protocol, which includes a discussion of the representativeness of the meteorological data set, was prepared and reviewed by the BAAQMD and CEC Staff prior to conducting the air quality impact analysis.

Potential Impacts Associated with Construction Activities

Based on the dispersion modeling assessment, the maximum CO and SOx impacts combined with the background concentrations will be below the AAQS. For particulate matter, the annual and 24-hour background concentrations exceed several of the AAQS without adding the modeled concentrations. As a result, the predicted impacts would also be greater than the AAQS. However, the construction activity would be finite and best available fugitive dust emission control techniques would be used throughout the 14-month construction activity period, as required by the BAAQMD. Construction impacts would be further reduced with the implementation of the additional construction mitigation included in Conditions of Certification AQ-SC-1 through AQ-SC5. As noted in the CEC Staff Assessment, compliance with these conditions would substantially eliminate the potential for significant air quality impacts during the construction period.

The predicted 1-hour and annual NO_2 impacts associated with construction, combined with the respective maximum background concentrations, would be less than the 1-hour state NO_2 standard and the annual federal NO_2 standard. As previously mentioned, the construction period for MEP is expected to be approximately 14 months. However, the recently adopted federal 1-hour NO_2 standard is based on the three year average of the 98th percentile concentration. Therefore, the predicted concentration for construction would be combined with the background concentration for the two years prior to construction or the predicted impacts from the first two years of normal operations. Under either scenario, MEP is not expected to cause a violation of the federal 1-hour NO_2 standard. Furthermore, BAAQMD includes an allocation for construction equipment exhaust emissions in the emissions inventory used to develop the regional air quality plans. Therefore, construction emissions are not expected to impede attainment or maintenance of the ozone standards in the Bay Area[4]. Therefore, with the implementation of best available fugitive dust emission control techniques and other proposed mitigation measures, the impacts from construction are expected to be less than significant.

Potential Impacts Associated with Commissioning Activities

During the preparation of the AFC, the maximum impacts associated with commissioning activities were evaluated assuming three turbines would undergo initial load testing and engine checkout or post-catalyst initial tuning activities simultaneously. Based on that analysis, the maximum facility NO_2 and CO impacts combined with the background concentration were less than the AAQS. However, since the preparation of the AFC, the EPA has adopted a more stringent 1-hour NO_2 standard. As a result, we re-evaluated the potential impacts and determined that while the maximum predicted 1-hour NO_2 concentrations from the simultaneous commissioning of three turbines would have the potential to exceed the new 1-hour NO_2 standard, the maximum predicted impact from the commissioning of a single turbine would be less than the new federal 1-hour NO_2 standard. The CEC Staff reached a similar conclusion regarding the potential 1-hour NO_2 impacts associated with the commissioning emissions for one turbine. Based on the results of the modeling, the BAAQMD

[4] BAAQMD. 1999. *CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans*. December.

included a condition in the FDOC which limits the number of turbines commissioned at one time to no more than one turbine per day (Condition of Certification AQ-9 and AQ-9a). The maximum SO_2, PM_{10}, and $PM_{2.5}$ impacts are expected to be equal to or lower than normal operating rates due to reduced loads during commissioning. Therefore, with the implementation of the Conditions of Certification for commissioning, the impacts from commissioning are expected to be less than significant.

Potential Impacts Associated with Normal Operations (Including Startups and Shutdowns)

The maximum predicted impacts associated with normal operations were based on conservative emission estimates. For example, the 1-hour impacts were based on the assumption that all four turbines would be in startup and shutdown mode simultaneously, the maximum predicted 24-hour impacts assume all four turbines would startup and shutdown 12 times per day with the remainder of the day at the maximum permissible emission rate, and the annual impacts assume all four turbines would operate 4,000 hours at the maximum permissible emission rate with 300 startup and shutdowns. Despite these conservative assumptions, the NO_2, SO_2, and CO concentrations combined with the background concentrations do not exceed the AAQS, including the recently adopted federal 1-hour NO_2 standard. Therefore, MEP will not cause or contribute to the violation of a standard, and the NO_2, SO_2, and CO impacts from operation will be less than significant. For PM_{10} and $PM_{2.5}$, the background concentrations exceed the AAQS without the proposed project, with the exception of the federal 24-hour standard. As a result, the predicted project impact plus background also exceeds the AAQS and the operation of the proposed project would further contribute to an existing violation of the standard absent mitigation. As discussed in the mitigation section, the Applicant is proposing to offset project emissions as required by BAAQMD and in accordance with the voluntary mitigation agreement with SJVAPCD. Therefore, the potential air quality impacts associated with normal operation will be less than significant.

Cumulative Modeling Results

We contacted both BAAQMD and SJVAPCD to identify potential cumulative air quality impact sources within 6 miles of MEP which had received construction permits but were not yet operational, or were in the permitting process and had the potential to emit 5 tons or more per year of NOx, CO, PM_{10}, $PM_{2.5}$, or SOx. At the time of the cumulative impact assessment, BAAQMD identified three facilities within 6 miles of MEP that met these criteria; the East Altamont Energy Center (EAEC), the Tesla Power Project (TPP), and Waste Management of Alameda County (WMAC). SJVAPCD confirmed that no facilities had requested or have received authority to construct permits within 6 miles of the MEP site in the previous two years. Therefore, the results of the cumulative impact assessment included the potential impacts associated with EAEC, TPP, WMAC, and MEP. However, as noted in the CEC's *Extension of the Deadline for Commencement of Construction*, August 13, 2008, the Applicant for EAEC is required to modify the air quality analysis to reflect the new emission standards that have taken effect since the project received certification and the TPP certification was recently terminated (October 16, 2009) at the Energy Commission. Therefore, the results of the cumulative impact assessment represent a conservative assessment of the reasonably foreseeable projects within six miles of MEP.

Despite the conservative nature of the analysis, the total hourly and annual NO_2 cumulative impacts would remain below the respective ambient air quality standards, including the recently adopted federal 1-hour NO_2 standard. Therefore, the cumulative NO_2 impacts would

be less than significant. The modeled cumulative impacts of SO_2 and CO are below the state and federal standards. Therefore, the SO_2 and CO cumulative impacts would be less than significant. The maximum predicted 24-hour PM_{10} and $PM_{2.5}$ cumulative impacts and the annual PM_{10} cumulative impact would exceed their respective ambient air quality standards. However, because the background ambient concentrations of PM_{10} and $PM_{2.5}$ are above the respective standards, any increase in PM_{10} or $PM_{2.5}$ concentrations would result in a significant impact without mitigation. In order to minimize the potential cumulative impacts, the Applicant will provide $PM_{2.5}$ and PM_{10} mitigation consistent with BAAQMD's New Source Review Rule and the voluntary SJVAPCD mitigation agreement. Therefore, significant cumulative PM_{10} or $PM_{2.5}$ impacts are not expected as a result of MEP.

D. Proposed Mitigation for MEP

Construction impacts will be reduced with the implementation of a construction fugitive dust and diesel-fueled engine control plan. The plan will focus on reducing construction air quality impacts and will include the CEC Staff Assessment construction mitigation measures AQ-SC3 and AQ-SC5.

During operations, the appropriate mitigation measure is to reduce potential air emissions before they are emitted. This has been accomplished by the careful design of the project and the installation of BACT. Air quality impacts will be further mitigated by providing emission offsets in excess of the quantity expected to be emitted. Because annual emissions of NO_x are expected to exceed the BAAQMD Regulation 2, Rule 3 emission offset thresholds (Table 3), the Applicant is required to surrender 52.8 tons of NOx emission reduction credits to BAAQMD prior to the issuance of the Authority to Construct (BAAQMD FDOC, Table 34). The Applicant possesses sufficient valid emission reduction credits to offset the emission increase of NOx from MEP.

TABLE 3
BAAQMD Emission Offset Applicability Analysis for MEP

Pollutant	Annual Emission Estimate[a] (tpy)	BAAQMD ERC Threshold (tpy)	ERCs Required (yes/no)	Quantity of ERCs Required[b]
NO_x	45.9	10	yes	52.8
VOC	5.6	10	no	—
SO_2	2.9	100	no	—
$PM_{10/2.5}$	18.6	100	no	—

[a]BAAQMD FDOC Table 14. Includes emissions estimates for normal turbine operations, turbine start-ups and shutdowns, and fire pump maintenance and testing.

[b]Per BAAQMD Rule 2-2-302, a facility permitted to emit more than 35 tpy, on a pollutant-specific basis, of precursor organic compounds or nitrogen dioxides shall offset emissions at a ratio of 1.15 to 1.0.

ERC = Emission Reduction Credit

Because the VOC, PM_{10}, $PM_{2.5}$, and SO_2 emissions do not exceed BAAQMD offset thresholds, there is no BAAQMD requirement to offset the project emissions for these pollutants. However, as stated previously, the Applicant voluntarily worked with SJVAPCD to develop a mitigation plan to reduce potential impacts to the SJVAB. To this end, the Applicant entered into an agreement with SJVAPCD on December 17, 2009, to generate emission reductions of non-attainment pollutants and their precursors in sufficient quantities to mitigate potential MEP

impacts on the SJVAB. As outlined in the agreement, the Applicant agrees to fund localized air emission reductions in the Northern Region of the SJVAB, particularly within or near the Mountain House Community Service District, City of Tracy, and San Joaquin County. The agreement requires the Applicant to provide funding to SJVAPCD within thirty (30) days after physical delivery of the first combustion turbine generator to the project site to allow sufficient time for SJVAPCD to generate contemporaneous emission reductions.

With the surrender of BAAQMD NOx ERC offsets and the execution of the SJVAPCD mitigation agreement, the Applicant will have provided sufficient mitigation for non-attainment pollutants (and their precursors) to reduce the project's air quality impacts to a less than significant level for all pollutants.

E. Consistency with LORS

BAAQMD issued the FDOC, demonstrating the project's compliance with all applicable federal, state, and local air quality LORS (FDOC page 100).

III. Greenhouse Gas Emissions

Although MEP will facilitate the integration of new and existing renewable generation consistent with the goals and policies of AB32, the greenhouse gas emissions were assessed for both the construction and operational phases of MEP. The emission calculations were based on the California Climate Action Registry (CCAR) Greenhouse Gas Reporting Protocol (GRP) and fuel consumption rates published by the EPA.

Based on the emission calculations for the construction phase, CEC staff have concluded the greenhouse gas emissions from construction would be less than significant based on the fact that the emissions would be short-term, intermittent, and mitigated to the extent possible through mitigation measures implemented for criteria pollutants (SA page 4.1-80). During operation, it is estimated MEP has the potential to emit approximately 430,000 metric tons per year of CO_2 equivalents. Therefore, the Applicant will be required to report GHG emissions annually to BAAQMD, ARB, and the EPA.

As noted by BAAQMD in the FDOC, the EPA has taken actions to ensure that no stationary sources will be required to get a Clean Air Act permit to cover GHG emissions in calendar year 2010. In addition, in the first half of 2011, only sources required by non-GHG emissions to obtain a permit under the Clean Air Act will need to address their GHG emission in their permit applications. Therefore, BAAQMD has concluded that the Applicant is not required to address GHG emissions from MEP under the Clean Air Act at this time (FDOC page 82). The CEC Staff also compared the MEP heat rate and GHG performance to other plants in the Greater Bay Area and San Joaquin County and concluded that compared to the other existing power plants that are in place to provide local reliability, MEP would be more efficient and emit fewer GHG emissions during any hour of operation. Furthermore, the project's maximum capacity factor is limited to 46 percent. Therefore, the project would not be subject to the limits of the GHG Emission Performance Standard (Cal. Code Regs., tit. 20, section 2900 et seq.) because MEP is a simple-cycle power plant, designed and intended to provide electricity at an annualized plant capacity factor less than 60 percent.

Therefore, the project is not expected to cause a significant GHG impact.

IV. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that 53 Conditions of Certification (COCs) be adopted to address air quality and greenhouse gas emissions including AQ-SC1 through AQ-SC10 and BAAQMD proposed permit conditions AQ-1 through AQ-43. The Applicant has reviewed the recommended COCs and finds them acceptable.

V. Correlation to SSA and Hearing Topics

- Air Quality
- Greenhouse Gases

This page intentionally blank

Biological Resources

I. Introduction

A. Name: Todd Ellwood

B. Qualifications: Mr. Ellwood's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.2 Biological Resources; Volume 2, Appendix 5.2A Resumes of Field Surveyors, dated June 15, 2009 [Exhibit 1].
- Supplement A, Data Adequacy, Biological Resources, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.2 Biological Resources, dated March 5, 2010 [Exhibit 6].
- Applicant's Responses to CEC Staff Requests, Data Response Set 1A & 1B, dated November 30, 2009. Responses to Data Requests 18 through 23 [Exhibit 7].
- Applicant's Response to CEC Staff Requests, Data Response Set 1D, Pages 3-1 to 3-4, dated March 31, 2010 [Exhibit 11].
- Applicant's Request for Waters of the United States Jurisdictional Determination, dated September 29, 2009 [Exhibit 24].
- Applicant's United States Army Corps of Engineers Wetland Delineation Amendment, dated December 3, 2009 [Exhibit 28].
- United States Army Corps of Engineers Preliminary Jurisdictional Determination, dated January 7, 2010 [Exhibit 29].
- Applicant's Comments regarding United States Army Corps of Engineers Wetland Delineation Amendment, dated February 16, 2010 [Exhibit 31].
- Clean Water Act Section 401 Water Quality Certification Application submitted to Central Valley Regional Water Quality Control Board, dated April 7, 2010 [Exhibit 36].
- United States Army Corps of Engineers' Letter to the United States Fish and Wildlife Service regarding Section 7 Consultation, dated April 20, 2010 [Exhibit 39].
- Biological Assessment Transmittal to the United States Fish and Wildlife Service, dated April 20, 2010 [Exhibit 40].

- Applicant's Responses to Information Requests for Formal Consultation, dated July 2, 2010 [Exhibit 44].
- Applicant's Biological Resources Mitigation Supplemental Information, dated September 9, 2010 [Exhibit 47].
- Applicant's Wetland Clarifications from Doug Urry, dated September 17, 2010 [Exhibit 48].
- Applicant's Technical Memorandum - Potential Bird Avoidance or Attraction to Exhaust Stacks and Thermal Plumes, dated July 27, 2010 [Exhibit 53].
- Updated MEP Biological Assessment Project Description and Conservation Measures and California Tiger Salamander and California Red-Legged Frog Relocation Plan, dated October 22, 2010 [Exhibit 58].
- USFWS e-mail regarding potential Golden Eagle project impacts dated October 13, 2010. [Exhibit 56].
- Technical Memorandum – Burrowing Owl Survey Report, dated November 23, 2010 [Exhibit 60].
- Applicant's Comments on the Staff Assessment related to Biological Resources, dated November 24, 2010 [Exhibit 61].

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

MEP will be a nominal 200 megawatt (MW) simple-cycle generating facility consisting of four GE LM6000 PC-Sprint natural gas fired combustion turbine generators and associated equipment. The proposed project site is in northeastern Alameda County, approximately 7 miles northwest of Tracy, 7 miles east of Livermore, 6 miles south of Byron, and approximately 2.3 miles west of the community of Mountain House. MEP will be located on a 10-acre portion of a 158-acre parcel located immediately south of the Pacific Gas & Electric (PG&E) Bethany Compressor Station and 230-kilovolt (kV) Kelso Substation.

Linear facilities will include: a new 580-foot-long 8-inch natural gas pipeline connection with PG&E's existing high-pressure gas line; a new 1.8-mile-long 10-inch water supply pipeline connection with the Byron Bethany Irrigation District's Canal 45; and an approximately 0.7-mile-long single-circuit, three-phase, 230-kV transmission line interconnection. The gas pipeline will run generally to the east from the project site staying on the Lee Property and will be installed in a relatively shallow trench. The majority of the water supply pipeline will be located within the Bruns Road right-of-way; a 1,000-foot section of the pipeline will be on BBID property adjacent to Canal 45, and an approximately 1,000-foot section of the pipeline will

follow the MEP access road on the project parcel. The water supply pipeline will cross seven culverts using either underground tunneling or open-cut trenching. The 230-kV line will run generally north from the project site, staying east of the Byron Power Cogen Plant, crossing Kelso Road, and staying east of the PG&E Bethany Compressor Station. It will turn west just north of the Kelso Substation, then turn south to the final interconnect point at PG&E's Kelso Substation.

Geographically, MEP will be located just above the Central Valley floor in a region of low-lying foothills at the base of the Altamont Hills. Non-native annual grassland characterizes the MEP site and laydown area, gas pipeline corridor, and transmission line corridor. Currently, the project parcel is actively managed for cattle grazing. At the MEP site, California ground squirrel (*Spermophilus beecheyi*) burrows are abundant. Small mammal burrows such as these provide potential refuge sites for California red-legged frog and California tiger salamander, and potential breeding habitat for western burrowing owl (*Athene cunicularia*), San Joaquin kit fox (*Vulpes macrotis mutica*), and American badger (*Taxidea taxus*). Although the MEP site is treeless, riparian habitat and landscaping trees found on adjacent properties within 1 mile provide nesting opportunities for a variety of avian species. A known Swainson's hawk (*Buteo swainsonii*) nest site is located in a large eucalyptus tree approximately ¼ mile west of the facility site.

Potentially jurisdictional waters of the U.S. (including wetlands) occur in the project area comprising seasonal, intermittent, and perennial waterbodies. Cattle stock ponds, ephemeral and intermittent drainages, vernal pools and other seasonal wetlands, and seasonal swales within and adjacent to the Project area provide breeding opportunities for the special-status aquatic species known to occur in the project area. California red-legged frog and California tiger salamander are known to occupy ponds in the project vicinity. Western pond turtle (*Actinemys marmorata*) could occur in the perennial ponds as well. During site surveys, vernal pool branchiopods were observed onsite in a seasonal wetland area and offsite in a seasonal alkali wetland.

Four well-defined intermittent and ephemeral drainages intersect the project's water supply pipeline route along Bruns Road either through concrete box culvert or corrugated metal pipe culvert. Each drainage is shown as a blue line on a U.S. Geological Survey (USGS) topographic map, indicating a waterway. All four features converge into a single channelized ditch outside the project area and flow northerly into Italian Slough, a delta waterway. Upstream of D-3 and D-4 from Bruns Road is California Department of Fish and Game's (CDFG) Byron Conservation Bank, where a stream restoration effort resulted in occupied breeding habitat for California red-legged frog. No aspect of MEP will impact the Byron Conservation Bank.

A seasonal alkali wetland exists east of the proposed gas pipeline route on the project parcel. The northern portion of this wetland supports playa pool conditions: it is largely unvegetated, has salt encrustations, and is fringed by halophytes including salt grass (*Distichlis spicata*). The wetland is hydrologically connected to an offsite ephemeral drainage and cattle stock pond. Similar playa conditions exist in an alkali meadow found just north of PG&E's Kelso Substation. All alkali wetland areas were recognized early in the design process as potentially sensitive habitat, and the Applicant has specifically designed the transmission line and gas pipeline to avoid them.

Cattle grazing is the dominant land use within in the project area. Typically these managed grasslands are characterized by introduced Mediterranean grasses such as brome (*Bromus diandrus, B. hordeaceous),* wild oat (*Avena fatua),* and barley (*Hordeum murinum*). Dominant forbs also tend to be introduced species such as storksbill (*Erodium cicutarium*), wild radish (*Raphanus sativa*), and mustard (*Brassica nigra*). Other species identified during the December 2008 reconnaissance survey include Italian thistle (*Carduus pycnocephalus*), yellow star-thistle (*Centaurea solstitialis*), Great valley gumweed (*Grindelia camporum*), black mustard (*Brassica nigra*), filarees (*Erodium botrys, E. cicutarium*), horehound (*Marrubium vulgare*), soft chess (*Bromus hordeaceus*), and foxtail barley (*Hordeum murinum* ssp. *leporinum*).

The power plant site and most of the proposed linear facility alignments provide foraging, cover, and some nesting habitat for a variety of common species. Mammals detected during the 2009 surveys include California ground squirrel (*Spermophilus beecheyi*), black-tailed jackrabbit (*Lepus californicus*), and coyote (*Canis latrans*). The project site lacks shrubs and trees, but could provide nesting habitat for ground-nesting birds or birds that nest in bulrush or cattail, which are present along the water supply pipeline route. The project area provides foraging or roosting habitat for a variety of bird species; some of the species observed in the project area include mallard (*Anas platyrhynchos*), black-necked stilt (*Himantopus mexicanus*), long-billed curlew (*Numenius americanus*), marsh wren (*Cistothorus palustris*), loggerhead shrike (*Lanius ludovicianus*), red-winged blackbird (*Agelaius phoeniceus*), and lark sparrow (*Chondestes grammacus*). Raptors detected foraging or roosting at the site include burrowing owl (*Athene cunicularia*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), and northern harrier (*Circus cyaneus*).

B. Special-Status Species

Special-status species include those listed as threatened or endangered under the federal or state endangered species acts, species proposed for listing, California Species of Special Concern, and other species that have been identified by the California Native Plant Society, USFWS, or CDFG or other agencies as unique or rare.

Special-Status Wildlife

The proposed project site currently provides habitat for several special-status wildlife species. The evidence that supports this conclusion includes numerous California Natural Diversity Database (CNDDB) occurrences, several site surveys conducted by CH2M HILL biologists confirming presence of suitable habitats, direct observation of species by CH2M HILL biologists during surveys (note: species below with an asterisk were observed during site surveys), and personal communication with USFWS and CDFG biologists. Special-status species known, presumed, or potentially using the project area for foraging, breeding, cover, or dispersal include the following.

- Western pond turtle
- California tiger salamander
- California red-legged frog
- American badger
- San Joaquin kit fox
- Burrowing owl*
- Swainson's hawk*

- Golden Eagle*
- Northern harrier*
- Loggerhead shrike*
- Vernal pool fairy shrimp
- Longhorn fairy shrimp

The project area is within designated critical habitat unit CCS-2b of the California red-legged frog, which encompasses almost the entire project (not including the water supply pipeline in Contra Costa County). Rather than conduct protocol-level surveys for California red-legged frog, California tiger salamander, San Joaquin kit fox, vernal pool fairy shrimp, and longhorn fairy shrimp, the applicant inferred for their presence for the purposes of formal consultation with the USFWS and CDFG under the Federal Endangered Species Act (ESA) and California ESA, respectively. Because of the proximity of known nests, the project site was presumed Swainson's hawk foraging habitat.

Special-Status Plants

The applicant conducted protocol-level special-status plant surveys April 7 and 15, May 20, and August 18, 2009. No special-status plant species were observed within the project disturbance area; however, heartscale (*Atriplex cordulata*) and little mousetail (*Myosurus minimus* ssp. *apus*), were found within the project vicinity.

C. Construction Impacts

The project site would permanently affect 10.1 acres and temporarily affect 24.2 acres of special-status species habitat, including annual grassland, wetlands and ephemeral drainages, and agricultural land (see Table 1). Of the 24.2 acres of temporary impacts, 12.1 acres would be disturbed by construction parking, temporary laydown, and cut and fill for the laydown and access road. This area would be disturbed for greater than 12 months, and therefore will require the same compensation levels as for permanent impacts. Construction activities may have a direct impact on individual species, for example when captured and relocated by biologists during preconstruction and ongoing surveys, or as a result of machinery and vehicle related mortalities.

TABLE 1
Project Impacts to Special-Status Wildlife Habitat

Work Area	Short-term Temporary Impacts (< 1 season; acres)	Long-term Temporary Impacts (> 1 season; acres)	Permanent Impacts (acres)
MEP Power Plant Site	0	2.9	9.7
MEP Access Road	0	0	0.4
MEP Laydown and Parking Area	0	9.2	0
Natural Gas Line	1.0	0	0
230-kV Transmission Line	8.5	0	0.01
Water Supply Pipeline	2.6	0	0.006
Total:	**12.1**	**12.1**	**10.1**

Note:
Includes undeveloped terrestrial areas potentially occupied by California red-legged frog, California tiger salamander, and San Joaquin kit fox.

Mitigation ratios and habitat compensation requirements of the proposed project (see Table 2 below) were determined during formal consultation with USFWS and CDFG for California red-legged frog (FT), California tiger salamander (FT/ST), San Joaquin kit fox (FT), and vernal pool branchiopods (FT/FE). The applicant has proposed to mitigate for these project impacts by purchasing credits at the proposed Mountain House Mitigation Bank. The 144-acre proposed bank is located directly adjacent to the project site, and provides suitable habitat for California tiger salamander, California red-legged frog, burrowing owl, San Joaquin kit fox, Swainson's hawk, and vernal pool branchiopods. However, this bank has not yet been finalized, and would need to be approved by both CDFG and USFWS in order to satisfy mitigation and compensation requirements. Compensatory mitigation for the listed species will also benefit other special-status species potentially affected by the proposed project, including western pond turtle, American badger, northern harrier, and loggerhead shrike.

TABLE 2
Compensatory Mitigation Requirements

Resource	Acres Impacted	Mitigation Ratio	Compensation Acreage
Listed Branchiopods			
Permanent Total:	0.018	3:1	**0.054**
California tiger salamander			
Permanent	10.1	3:1	30.3
Long-Term Temporary	12.1	3:1	36.3
Short-Term Temporary	12.1	1.1:1	13.3
Total:			**79.9**
California red-legged frog			
Permanent	10.1	3:1	30.3
Long-Term Temporary	12.1	3:1	36.3
Short-Term Temporary	12.1	1.1:1	13.3
Total:			**79.9**
San Joaquin kit fox			
Permanent	10.1	3:1	30.3
Long-Term Temporary	12.1	3:1	36.3
Short-Term Temporary	12.1	1.1:1	13.3
Total:			**79.9**
Swainson's hawk			
Permanent	10.1	1:1	10.1
Long-term temporary	12.1	1:1	12.1
Total:			**19.3**

TABLE 2
Compensatory Mitigation Requirements

Resource	Acres Impacted	Mitigation Ratio	Compensation Acreage
Western burrowing owl			
Permanent	TBD	2:1	TBD
Long-term temporary	TBD	2:1	TBD
Total:			**TBD**

Notes:

With approval by agencies, mitigation will be combined if compensatory habitat conditions meet the species requirements.

TBD = To Be Determined based on results of preconstruction surveys. If a compensatory site is determined necessary due to impacts to species, the site will support double the number of owls displaced by the project.

There are multiple jurisdictional wetlands and other waters within the project vicinity, including ephemeral drainages, seasonal wetlands, alkali meadow, erosional ditches, and swales. Direct impacts include permanent impacts to the entire 0.018-acre seasonal wetland (SWL-1) north of the proposed power plant site, along the proposed access road disturbance route; permanent impacts to a 0.0008-acre area of Canal 45; temporary impacts to a 0.0004-acre area of an unvegetated streambed (D-2), and; temporary impacts to 0.0008-acre of alkali sink wetland (ASW-1). Other impacts could result from erosion, sedimentation, and discharge of contaminated water into drainages or wetlands. To mitigation for potential impacts to Waters of the U.S., the Applicant will implement the avoidance and protection measures listed in the USACE Clean Water Act (CWA) 404 permit, RWQCB 401 Water Quality Certification, and a CDFG 1602 Streambed Alteration Agreement. To compensate for the permanent loss of SWL-1 and Canal 45, the Applicant will purchase wetland creation credits (based on a 1:1 ratio) from the USACE-approved Cosumnes Floodplain Mitigation Bank.

D. Operational Impacts

Direct and indirect impacts to birds including potential for collision with structures (stacks and transmission lines) are expected to be minimal given the relatively short heights of the new stacks and new transmission line including poles. In addition, the stacks will be sited between two flanking hills within a valley and the new transmission line will be in the immediate vicinity of taller existing high-voltage transmission lines. It is expected that resident and migrating wildlife in the area would be accustomed to maneuvering around such features and the potential for avian collisions is expected to be minimal.

Operationally the project will result in habitat fragmentation and cause a barrier to dispersal for terrestrial species such as California red-legged frog, California tiger salamander, and San Joaquin kit fox. Common and special-status species may enter the fenced facility in search for food or cover and thus may be killed from entrapment or vehicle mortality. A new 6-inch tall curb or similar barrier installed along the perimeter fence will discourage entry by California tiger salamander and the perimeter fence will be properly maintained to minimize the potential for access by other wildlife including San Joaquin kit fox.

Generally, noise from construction and operation of these project features would not cause significant adverse impacts on wildlife, as wildlife can be expected to acclimate to routine background noise.

E. Summary of Cumulative Impacts

As described previously, MEP will cause adverse impacts to biological resources, will fill a seasonal wetland, and impact critical habitat of the California red-legged frog. Avoidance and minimization measures developed in consultation with the USFWS, CDFG, USACE, RWQCB, and CEC will minimize or offset these impacts to less than significant levels. The potential impact to special-status species will be mitigated by conducting preconstruction surveys, employing agency-approved biological monitor(s), administering a worker environmental training program, and marking sensitive resource areas for avoidance, to name a few. Habitat loss, including critical habitat, will be compensated for by purchasing species credits from the proposed Mountain House Conservation Bank, which is located in the immediate vicinity of the project site and within California red-legged frog critical habitat. Because MEP would not result in significant adverse impacts that cannot be mitigated, impacts would not likely combine with those projects of the past, present, or reasonable foreseeable future to result in cumulative significant impacts.

F. Mitigation Measures

Proposed conservation protection measures to avoid and minimize impacts to biological resources within and adjacent to the MEP project area are summarized as follows:

1. Prior to construction, conduct clearance surveys for special-status species including western pond turtle, California tiger salamander, California red-legged frog, American badger, San Joaquin kit fox, Burrowing owl, Swainson's hawk, raptors and migratory birds, and listed Branchiopods;
2. Conduct Worker Environmental Awareness Training for all construction personnel;
3. Conduct construction monitoring by a qualified Designated Biologist and onsite Biological Monitors during construction activities;
4. Minimize the construction footprint as much as feasible and restore temporary disturbance areas to preconstruction conditions;
5. Clearly demarcate construction work areas using temporary perimeter fence, markers, and/or signage and install wildlife exclusion fencing;
6. Establish exclusion zones around biologically sensitive areas and any nests or other sensitive resources identified during surveys;
7. Adhere to any seasonal work restrictions in and/or adjacent to aquatic habitats;
8. Implement Best Management Practices (BMPs) listed in the Stormwater Pollution Prevention Plan (SWPPP); and,
9. Implement the project in accordance with permits issued by USACE, RWQCB, USFWS, and CDFG.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that 19 Conditions of Certification (COCs) be adopted to address Biological Resource issues: BIO-1 through BIO-19. The Applicant has reviewed the COCs and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Biological Resources

This page intentionally blank

Cultural Resources

I. Introduction

A. Name: Clint Helton

B. Qualifications: Mr. Helton's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.3 Cultural Resources; Volume 2, Appendix 5.3A Agency Consultation Letters, Appendix 5.3B Cultural Resources Assessment Report, Appendix 5.3C CHRIS Literature Search Results, Appendix 5.3D Resumes of Cultural Resources Staff, Appendix 5.3E Maps of Previously Conducted Surveys, dated June 15, 2009 [Exhibit 1].
- Supplement A, Data Adequacy, Cultural Resources, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.3 Cultural Resources, dated March 5, 2010 [Exhibit 6].
- Applicant's Response to CEC Staff Requests, Data Response Set 1A and 1B, dated November 30, 2009. Responses to Data Requests 24 through 49 [Exhibit 7].
- Applicant's Response to CEC Staff Requests, Data Response Set 1C, dated February 12, 2010. Response to Data Request 48 [Exhibit 8].
- Applicant's Response to CEC Staff Requests, Data Response Set 1D, dated March 31, 2010. Response to CEC Staff and Data Request 56 [Exhibit 11].
- Applicant's Notice of Need for Additional Time to Answer Staff Data Requests, dated November 12, 2009 [Exhibit 26].
- Applicant's Report of Conversation – Cultural Resources Survey of CEC 50-foot Buffer Area, dated January 15, 2010 [Exhibit 30].

D. Submitted With a Request for Confidential Treatment:

- Confidential Cultural Resources – Appendix 5.3E and 5.3C of the Application for Certification, dated June 15, 2009.
- Confidential Cultural Resources – Figure DA5.3-1R of the Data Adequacy Supplement, dated August 3, 2009.

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such

opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

MEP will be located in northeastern Alameda County, on a 10-acre portion of a 158-acre parcel south of the Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and 230-kilovolt (kV) Kelso Substation.

MEP will be interconnected with the regional electrical grid by a new, approximately 0.7-mile-long, single-circuit, three-phase, 230-kV transmission line. The proposed 230-kV line will run generally north from the project site, staying east of the Byron Power Cogen Plant, crossing Kelso Road, and staying east of the PG&E Bethany Compressor Station. It will turn west just north of the Kelso Substation, then turn south to the final interconnect point at the Kelso Substation.

MEP will use water supplied by Byron Bethany Irrigation District (BBID) via a new, 1.8-mile pipeline. The majority of the water supply pipeline will be located within the Bruns Road right-of-way, a 1,000-foot section of the pipeline will be on BBID property, and an approximately 1,000-foot section of the pipeline will be on the project property.

Natural gas for MEP will be provided via an approximately 580-foot long 8-inch-diameter natural gas pipeline that will run directly northeast from the project site to interconnect with PG&E's existing high pressure natural gas pipeline. The natural gas supply pipeline for MEP will tap into the existing PG&E Line 2 and be routed underground entering the project site at its northeastern corner. The entire approximately 580-foot pipeline will be constructed within the 158-acre property.

A cultural resources inventory, which included archival research, reconnaissance, and a surface pedestrian survey, was conducted for the project. The archaeological survey area included the MEP plant site, the construction laydown/parking area, the transmission line corridor, the reconductored Kelso–Tesla 230-kV line (Kelso–USWP Ralph), and the Kelso–Tesla 230-kV line (USWP Ralph–Tesla) transmission line corridors, the natural gas pipeline route, water pipeline corridor, a 200-foot buffer around the plant site and laydown area, and a 50-foot buffer around all project linears.

CH2M HILL commissioned a literature search for MEP from staff of the CHRIS Northwest Information Center using a definition of a 1-mile buffer zone around the MEP plant site, associated laydown/parking area, and a 0.25-mile buffer zone around the proposed linear facilities. This search radius encompasses the entire research area required by the CEC for both the archaeological and architectural surveys. The record search indicated that there are eight previously recorded properties within a mile of the project site and laydown areas. Despite four previous surveys of the proposed project site and laydown areas dating back to 1977, no cultural resources have been identified within any of the areas that will be directly impacted by MEP. Each recorded property is located well outside of the MEP facilities, and the project will have no effect on them. The Delta-Mendota Canal is located within the 1 mile search area. In 2005, in consultation with the State Historic Preservation Officer, the Delta-Mendota Canal was

determined to be eligible for the National Register of Historic Places (NRHP) under Criteria A and C. Also, a small section of the California Aqueduct is just within the boundary of the survey area; it does not meet the age criteria for evaluation for eligibility to the California Register of Historical Resources (CRHR) or the NRHP.

A cultural resources survey of the proposed MEP Area of Potential Affect (APE) was conducted in 2009 on March 18 by CH2M HILL Cultural Resources Specialists. Exposed soils, consisting mainly of previously disturbed agricultural sediments and road bed material, were inspected carefully, and no evidence of cultural materials was noted. Given the local topography, distance to major stream drainages or other archaeologically sensitive features, and the scale and scope of previous ground disturbance in the area, archaeological sensitivity of the surface soils of the MEP site and appurtenant proposed facilities is considered moderate to low.

A cultural resource survey of the built environment of the MEP APE was conducted on March 23, 2009. The literature search revealed there are no known NRHP- or CRHR-listed properties located in the MEP APE. A windshield survey was undertaken and buildings that appeared to be more than 45 years of age were recorded within the area. None of the properties identified as potentially historic appear to meet any of the National Register of Historic Places (NRHP) or California Register of Historical Resources (CRHR) criteria. There is no pattern of development or use of style in any of areas where these properties are located.

CH2M HILL contacted the Native American Heritage Commission (NAHC) to request information about traditional cultural properties such as cemeteries and sacred places in the MEP APE. The NAHC responded with a list of Native Americans interested in consulting on development projects. Each of these individuals/groups was contacted. No concerns have been expressed by those contacted.

The NAHC record search of the Sacred Lands file did not indicate the presence of Native American cultural resources in the immediate MEP APE. The record search conducted at the CHRIS Northwest Information Center also did not indicate the presence of Native American traditional cultural properties.

Additionally, CH2M HILL contacted local historical societies within the project area, including the East Contra Costa Historical Society and Museum, the Tracy Historical Museum, and the Alameda County Historical Society. The Alameda County Historical Society responded on April 14, 2009, to indicate they had no information to provide and suggested contacting the Amador Livermore Valley Historical Society in Pleasanton and the Livermore Heritage Guild. A request for information was sent to the Amador Livermore Valley Historical Society on April 28, 2009. On April 26, 2009, the Tracy Genealogical Society responded that it had no information and said it would forward the request to the Tracy Historical Museum. No other responses have been received at the time of this printing.

B. Construction Impacts

The literature search, pedestrian inventory, and windshield survey have shown that there are no prehistoric or historic sites located within the MEP site or laydown areas. Although four historic sites are located within 0.5 miles of MEP facilities, all are located well outside the area of impact and none will be affected by MEP. Additionally, none of these four resources is considered eligible for the CRHR or NRHP. Therefore, the project is unlikely to have an adverse effect on significant historical or archaeological sites that are eligible for listing in the CRHR.

Finally, there are no known cemeteries in the project area or laydown areas that project construction might disturb.

Due to the extensive disturbance by the construction and dismantling of the wind farm, the project is unlikely to encounter buried intact cultural resources that have not previously been disturbed or destroyed in sediments near the ground surface. However, some limited potential does exist for intact cultural resources to be discovered in soils below the plow zone. With the incorporation of mitigation described in the Staff Assessment, construction impacts to cultural resources will be less than significant.

C. Operational Impacts

No ground disturbance will be required during project operation; therefore, impacts on cultural resources are not anticipated during operation of the proposed facility. Maintenance of all project facilities will not cause any effects outside of the initial construction area of impact.

D. Summary of the Cumulative Impacts

As described above, MEP will not cause any adverse impacts on archaeological or historic resources or traditional cultural properties. The likelihood of encountering buried archaeological resources extremely low. The project is unlikely, therefore, to have impacts that will combine cumulatively with other closely related past, present, and reasonably foreseeable future projects. With the incorporation of mitigation described in the AFC, the project will not contribute to a cumulatively considerable significant impact to cultural resources.

E. Mitigation

Although significant archaeological and historical sites were not found during the survey for MEP, some possibility does exist that subsurface construction activities could encounter buried archaeological materials (i.e., artifacts). For this reason, MEP will include measures to mitigate any potential adverse impacts that could occur if buried cultural resources were inadvertently discovered. These measures include: (1) designation of a CRS to be on call to investigate any cultural resource finds made during construction, (2) implementation of a construction worker training program, (3) procedures for halting construction in the event that there is an inadvertent discovery of archaeological deposits or human remains, (4) procedures for evaluating an inadvertent archaeological discovery, and (5) procedures to mitigate adverse impacts on any inadvertent archaeological discovery determined significant.

Once MEP is operational, it is anticipated that no additional disturbance will occur at the MEP plant site, laydown area, or associated linear features.

III. Proposed Licensing Conditions

The Staff Assessment for the project filed by the CEC recommends that nine Conditions of Certification be adopted to address Cultural Resources, CUL-1 and CUL-8. The Applicant has reviewed the Staff's COCs and finds them acceptable.

IV. Correlation to SA and Hearing Topics

- Cultural Resources.

This page intentionally blank

Geologic Hazards and Resources

I. Introduction

A. Name: Thomas A. Lae and Dean Harris

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.4 Geologic Resources; Volume 2, Appendix 2C Preliminary Geotechnical Report, dated June 15, 2009 [Exhibit 1].
- Supplement A Data Adequacy, Geological Hazards and Resources, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.4 Geologic Resources and Hazards, dated March 5, 2010 [Exhibit 6].
- Data Response Set 1A & 1B, dated November 30, 2009. Response to CEC Staff Data Request 50 [Exhibit 7].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The MEP site is a 10-acre portion of a 158-acre parcel located in northeast Alameda County, California, near the western edge of the San Joaquin Valley and near the border of the Coast Ranges and the Great Valley geomorphic provinces. The proposed generating facility site is underlain by Quaternary alluvial and bedrock deposits.

The project site is located within a seismically active region influenced by the San Joaquin Fault system and the Coast Ranges/Sierran Block boundary zone. In addition there are eleven major faults that could influence seismic design at the site. No active faults were found to cross either the MEP site or any of the linear facility corridors; therefore, the likelihood of ground rupture is considered low.

There are no known geologic resources of recreational or scientific value at the project site or in the project vicinity. There are no oil and gas extraction facilities, sand/gravel quarries at or near the MEP site.

B. Project Impacts

There is potential for seismic ground shaking to affect the project site in the event of a large-magnitude earthquake occurring on fault segments located near the project. MEP, however, is not located within an Alquist-Priolo Earthquake Fault Zone or within the trace of any known active fault. The project will thus not be likely to cause direct human exposure to ground rupture. Seismic hazards and potential adverse foundation conditions will be minimized by conformance with the recommended seismic design criteria of the CBC seismic requirements. Potentially expansive soils that have been identified at the site can be mitigated by removal/ replacement with non-expansive soil. The findings of geotechnical explorations at the site indicate that the probability of liquefaction, mass wasting, or subsidence occurring at the project site is low to nonexistent.

The project structures, equipment, and the natural gas compressor station will be designed in accordance with CBC seismic requirements. Compliance with the CBC seismic requirements will minimize the exposure of people to the risks associated with large seismic events.

Based on the analysis presented, the project will have no effect on oil and gas production or on other geologic resources of commercial value or on the availability of such resources.

C. Summary of the Cumulative Impacts

MEP will not cause any adverse impacts on geological resources and will not cause an exposure of people or property to geological hazards. There are no minor impacts that could combine cumulatively with those of other projects.

D. Mitigation

The following mitigation measures are proposed for the project:

- Structures will be designed to meet seismic requirements of the 2007 CBC. Moreover, the design of plant structures and equipment will be in accordance with CBC Seismic requirements to withstand peak ground acceleration of up to 0.6g at the site from a design basis earthquake. The geotechnical exploration for the project did not encounter significant hazards. The preliminary design geotechnical report (CH2M HILL, 2009)[1] provided recommendations for the design of foundations for the facilities with consideration the site specific conditions.
- A geotechnical engineer will be assigned to the project to carry out the duties required to assess geologic conditions during construction and approve actual mitigation measures used to protect the facility from geologic hazards.
- Recommendations for design and construction for the foundations, with consideration of the effects of the potentially expansive soil were presented in the preliminary design

[1] CH2M HILL. 2009. Geotechnical Conditions and Preliminary Recommendations, Mariposa Energy Project, Preliminary Geotechnical Design Memorandum. May 4.

geotechnical report. These measures included placement of select granular fill for the foundation pad; over-excavation of the native clay soils beneath the site equipment pad; and placement of granular fill beneath selected facilities.

With the implementation of these mitigation measures, MEP will not result in significant direct, indirect, or cumulative geology-related impacts.

III. Proposed Licensing Conditions

The Staff Assessment (SA) for the project recommends three conditions related to engineering geology. These are Conditions of Certification (COC) GEN-1, GEN-5, and CIVIL-1 in the Facility Design section. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

IV. Correlation to SA and Hearing Topics

- Geology and Paleontology
- Facility Design

This page intentionally blank

Hazardous Materials Handling

I. Introduction

A. Name: Doug Urry and Jerry Salamy

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.5 Hazardous Materials Handling; Volume 2, Appendix 5.5A Offsite Sensitive Receptors, Appendix 5.5B OCA Modeling, dated June 15, 2009 [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.5 Hazardous Materials Management, dated March 5, 2010 [Exhibit 6].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].
- Applicant's Comments on the Staff Assessment related to Hazardous Materials, dated November 24, 2010 [Exhibit 61].

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

The proposed 10-acre MEP site is located in unincorporated eastern Alameda County, California, within a larger 158-acre parcel. The main site access is off of Bruns Road. The project also includes an adjacent 9.2-acre temporary construction laydown and worker parking area on the same parcel.

Land use in the area surrounding the project site is primarily agricultural. A 6.5-megawatt cogeneration facility is located on the same parcel, northeast of MEP. Additionally, several utility-related facilities are located in the immediate area, including the Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and Kelso Substation. Sensitive receptors within a 6-mile radius of the project site include five schools and 23 preschool/day care facilities. The nearest of these receptors, as well as the nearest school to the project site, is Mountain House School at 3950 Mountain House Road, located approximately 1.3 miles east of the project site.

The nearest hospital is Sutter Tracy Community hospital, which is located approximately 9.6 miles southeast.

MEP will use hazardous materials during construction and operation. Hazardous materials are required for emissions control and facility operation and maintenance, such as lubrication of equipment, or will be contained within transformers and electrical switches. Mariposa Energy will comply with applicable laws and regulations for the storage of these materials to minimize the potential for a release of hazardous materials and will conduct emergency response planning to address public health concerns regarding hazardous materials storage and use. Storage locations for the hazardous materials that will be used during operation are described in Table 5.5-1 of the AFC.

A. Construction Impacts

During construction of the project and linears, regulated substances, as defined in California's Health and Safety Code, Section 25531, will not be used.

Hazardous materials to be used during construction of the project and its associated linear facilities will include gasoline, diesel fuel, motor oil, hydraulic fluid, solvents, cleaners, sealants, welding flux, various lubricants, paint, and paint thinner. There are no feasible alternatives to vehicle fuels and oils for operating construction equipment. The types of paint required are dictated by the types of equipment and structures that must be coated and by the manufacturers' requirements for coating.

The quantities of hazardous materials that will be onsite during construction are small relative to the quantities used during operation. In addition, the quantities of hazardous materials that will be handled during construction are relatively small and Best Management Practices (BMPs) will be implemented by contractor personnel. Construction personnel will be trained to handle the materials properly. Therefore, the potential for environmental effects is expected to be small.

Construction will involve the transport of limited quantities of hazardous materials to the MEP site and will pose minor hazards associated with their use. Small fuel spills may also occur during onsite refueling. The potential environmental effects from fueling operations are expected to be limited to small areas of contaminated soil. If a fuel spill occurs on soil, the contaminated soil will be placed into barrels or trucks for offsite disposal as a hazardous waste.

B. Operational Impacts

Most of the hazardous substances that will be used by the project are required for facility maintenance and lubrication of equipment, or will be contained within transformers and electrical switches. The only regulated substance that will be used for the project is 19-percent aqueous ammonia used for emissions control.

One 10,000-gallon aqueous ammonia aboveground storage tank (holding a maximum of 8,500 gallons of aqueous ammonia) will be installed at the MEP facility. The ammonia storage tank and truck unloading area will drain into a secondary containment basin capable of holding the full contents of the tank, plus rainwater. Approximately two to three times per month (or a maximum of 33 deliveries per year), one 6,500-gallon tanker truck will deliver aqueous ammonia to the site.

Storage and use of ammonia will be subject to the requirements of the California Fire Code, Article 80, as well as California Accidental Release Prevention (CalARP) program. Article 80 of the California Fire Code contains specific requirements for control of liquid and gaseous releases of hazardous materials. Secondary containment will be provided for the ammonia storage tank and loading area. Additionally, the facility will be required to prepare a Risk Management Plan (RMP) in accordance with CalARP, further specifying safe handling procedures for the ammonia as well as emergency response procedures in the event of an accidental release. The RMP will be prepared for the site prior to operation of MEP.

Because of its potentially hazardous properties, ammonia is classified as a regulated substance, and an accidental release of ammonia could potentially present a human health hazard. If an aqueous ammonia solution were to leak or be released without proper controls, the ammonia in solution could evaporate as a gas into the atmosphere. The results of the offsite consequence analysis for the worst-case release scenario of 19-percent aqueous ammonia at MEP indicate that there will be no exceedances of the toxic endpoints beyond the project fenceline and no significant offsite impacts associated with a worst-case failure of the ammonia tank.

Materials will be handled in accordance with a Hazardous Materials Business Plan (HMBP) approved by the Alameda County Fire Department, Alameda County Environmental Health Department, and the CEC. With proper storage and handling of flammable materials in accordance with the California Fire Code and the site-specific HMBP, the risk of fire and explosion at the generating facility will be minimal.

Project operation will require regular transportation of hazardous materials to the project site. Transportation of hazardous materials will comply with all California Department of Transportation (Caltrans), U.S. Environmental Protection Agency (EPA), California Department of Toxic Substances Control (DTSC), California Highway Patrol (CHP), and California State Fire Marshal regulations. Aqueous ammonia, a regulated substance, will be delivered to the facility and transported in accordance with Vehicle Code Section 32100.5, which regulates the transportation of hazardous materials that pose an inhalation hazard. Ammonia will only be transported along approved transportation routes. The proposed transportation route for hazardous materials used at MEP will avoid schools in the project area to the greatest extent feasible.

The natural gas fuel the facility will use is flammable and could leak from the pipeline that brings the gas from the main PG&E distribution pipeline. Natural gas is composed mostly of methane, but also may contain ethane, propane, nitrogen, butane, isobutene, and isopentane. It is colorless, odorless, tasteless, and lighter than air. Pipeline natural gas contains an added odorant so leaks or releases can be detected. At concentrations of 5 to 14 percent, methane is flammable and can detonate. Natural gas, therefore, poses a risk of fire and explosion if an accidental release were to occur. However, the risk of a fire and/or explosion would be minimized through compliance with applicable codes, regulations, and industry design/construction standards. The project's pipeline will be designed to meet at least Class 1 service and will meet California Public Utilities Commission (CPUC) General Order 112-D and 58-A standards, in addition to the federal requirements for gas pipeline construction and safety.

C. Cumulative Effects

At the time of AFC preparation, six projects were either planned or currently under way near the MEP site. With the exception of two projects, the East Altamont Energy Center and the Tesla Power Project, the planned projects are not uses that would be anticipated to store hazardous materials in quantities significant enough to cause cumulative impacts. Furthermore, the Midway Power Project no longer holds a CEC License, and is therefore no longer a reasonably foreseeable project.

Although the probability of a simultaneous release of ammonia from two or more sources is very low, the possibility of a multiple-release scenario was considered. Because of the distance between MEP and the proposed East Altamont Energy Center, and because it is anticipated that a release of aqueous ammonia at MEP would not cause offsite impacts, cumulative effects from a simultaneous release would not be expected.

Additionally, existing laws and regulations address the handling and transportation of hazardous materials, and will ensure that all hazardous materials at MEP are safely managed.

D. Mitigation

As outlined in the AFC, potential impacts during the construction and operational phases will be mitigated through extensive implementation of engineered controls, training, best management practices, and the development of plans and procedures. With the implementation of the proposed control measures and the Conditions of Certification, the project will comply with all applicable federal, state, and local laws, ordinances, regulations, and standards (LORS).

Construction Phase

During the construction phase, the following control measures will be followed: use of BMPs to reduce the potential for the release of construction-related fuels and other hazardous materials to stormwater and receiving waters; construction personnel will follow general industry health, safety, and environmental standards for filling and servicing construction equipment and vehicles; should a spill contaminate soil, the soil will be put in containers and disposed of as appropriate; all containers used to store hazardous materials will be inspected at least once per week for signs of leaking or failure; all maintenance and refueling areas will be inspected monthly; and results of inspections will be recorded in a logbook that will be maintained onsite.

Small spills will be contained and cleaned up immediately by trained, onsite personnel. If a spill involves hazardous materials quantities equal to or greater than the specific RQ (42 gallons for petroleum products), all federal, state, and local reporting requirements will be followed. In the event of a fire or injury, the local fire department will be called.

All personnel working on the project during the construction phase will be trained in handling hazardous materials and the dangers associated with hazardous materials. An onsite health and safety person will be designated to implement health and safety guidelines and to contact emergency response personnel and the local hospital, if necessary.

Operation Phase

All hazardous materials and one regulated substance, aqueous ammonia, stored onsite during MEP operation will be handled and stored in accordance with applicable codes and regulations.

In accordance with CalARP regulations, an RMP will be prepared for the ammonia tank and will include a hazard assessment to evaluate the potential effects of accidental releases; a program for preventing accidental releases; and a program for responding to accidental releases to protect human health and the environment. An SPCC plan will also be prepared for MEP.

Transportation will comply with the applicable regulations for transporting hazardous materials, including Caltrans, EPA, DTSC, CHP, and California State Fire Marshal regulations.

An HMBP will be prepared in accordance with the Health and Safety Code (Section 25504) to include an inventory and location map of hazardous materials onsite and an emergency response plan for hazardous materials incidents. In accordance with emergency response procedures specified in the HMBP, designated personnel will be trained as members of a plant hazardous materials response team, and team members will receive the first responder and hazardous material technical training to be developed in the HMBP, including training in appropriate methods to mitigate and control accidental spills. In the event of a chemical emergency, plant personnel will defer to the Alameda County Environmental Health Department and first responders.

Alameda County Fire Department (ACFD) Station 8, located at 1617 College Avenue in Livermore, will be the primary responding station to MEP. It is located 19 miles from the project site and the response time to an emergency at the project site is about 30 minutes. There are three hazardous materials response (hazmat) teams in Alameda County, based at Stations 4, 12, and 20. The closest, and first responding hazmat team to MEP, is from Station 20, located at 7000 East Avenue in Livermore, which is 16 miles from MEP, with a response time of about 25 minutes. ACFD has a mutual aid agreement with Tracy Fire Department (TFD). The mutual aid agreement calls for TFD to dispatch resources, if available, from Station 98, located at 911 Tradition Street in the community of Mountain House (Bosch, 2009). Station 98 is approximately 4.2 miles via road from the project site. The response time from Station 98 to the project site is approximately 12 minutes.

In accordance with applicable federal, state, and local regulations, site personnel will regularly inspect all hazardous materials handling facilities for compliance with applicable regulations and would ensure that any deficiencies were promptly repaired. Additionally, the facility will be subject to regular inspections by the Alameda County Department of Environmental Health, which will ensure compliance with appropriate regulatory requirements for hazardous materials and regulated substances handling.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that 7 Conditions of Certification be adopted to address hazardous materials management issues: HAZ-1 through HAZ-7. The Applicant has reviewed the Staff's proposed Conditions of Certification set forth in the SSA and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Hazardous Materials

This page intentionally blank

Land Use

I. Introduction

A. Name: Josh Hohn, James Gwerder, Adolph Martinelli, and David Blackwell, Esq.

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.6 Land Use; Volume 2, Appendix 5.6A Alameda County Load and Resource Balance, dated June 15, 2009 [Exhibit 1].
- Supplement A, Data Adequacy, Land Use, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.6 Land Use, dated March 5, 2010 [Exhibit 6].
- Robert Sarvey Data Response Set 1, dated February 2010. Data Requests 4 through 8 [Exhibit 9].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].
- Applicant's Data Response Set 2A, dated April 12, 2010. Responses to CEC Staff, Data Requests 1 to 4 [Exhibit 12].
- Applicant's R. Dighe Data Response Set 2, dated May 4, 2010. Responses to Dighe Data Requests 5 to 10 [Exhibit 13].
- Alameda County 2002 Letter RE: East Altamont Energy Center Consistency with Alameda County General Plan, dated April 26, 2002 [Exhibit 19].
- Letter from the California Department of Conservation to Mariposa Energy, LLC. Discussing the Williamson Act, dated July 6, 2009 [Exhibit 20].
- Objection to Data Request 4 of Robert Sarvey, dated February 18, 2010 [Exhibit 32].
- ROC Between B. Jensen of Alameda County Planning Department and L. Worral Regarding Projects Proposed in the MEP Site Vicinity, dated April 15, 2010 [Exhibit 38].
- Consistency with Alameda County General Plan and Williamson Act Contracts, dated May 20, 2010 [Exhibit 41].

- Clarification from B. Jensen on Potential Agricultural Mitigation, dated May 27, 2010 [Exhibit 42].
- Clarification from B. Jensen on Maximum Building Intensity in the LPA Land Use Designation, dated June 18, 2010 [Exhibit 43].
- Alameda Co. 2002 Letter RE Tesla Power Plant Consistency with Alameda Co. General Plan & Williamson Act Contracts, dated July 6, 2010 [Exhibit 45].
- Alameda County Letter - MEP Consistency with Alameda County General Plan, dated September 17, 2010 [Exhibit 49].
- Contra Costa County Letter, MEP Follow up Comments, dated October 4, 2010 [Exhibit 54].
- Applicant's Comments on the Staff Assessment, related to Land Use, dated November 24, 2010 [Exhibit 61].

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The proposed 10-acre project site is located in unincorporated eastern Alameda County, California, within a larger 158-acre parcel. The main site access is off of Bruns Road. The project also includes an adjacent 9.2-acre temporary off-site construction laydown and worker parking area. The proposed project site is located directly southwest of the existing 6.5-megawatt (MW) Byron Power Cogen Plant, which occupies 2 acres in the middle portion of the 158-acre parcel.

Uses in the study area include grazing, power generation, power transmission, natural gas compression, water management facilities, and a State Recreation Area. Grazing occurs on a majority of the land within a 1-mile radius of the project site. The Kelso Substation and Bethany Compressor Station are located directly north of the project site, along Kelso Road. Further east on Kelso Road is the Western Area Power Administration Tracy Substation. The California Department of Water Resources Delta Pumping Plant is located northwest of the project site, near the end of Kelso Road and midway along the California Aqueduct between Clifton Court Forebay and Bethany Reservoir. The Delta-Mendota Canal is located east of the project site, and the Tracy Pumping Plant, managed by the U.S. Bureau of Reclamation, is located northeast of the project site, along Kelso Road. The Bethany Reservoir State Recreation Area is approximately 0.7 miles southwest of the MEP site. Mountain House School, an elementary school, is located outside the study area approximately 1.3 miles east of the project site, along Mountain House Road. The project is located away from residential areas and other sensitive receptors. The closest residence is approximately 0.5-mile northwest of the site.

Existing land uses within one mile of the project site and 0.25 mile of the pipeline corridor include agriculture, public utilities, residences, and water management. The project site and most of the surrounding land is designated as Large Parcel Agriculture within the ECAP and is non-prime Grazing Land. The project site is also within the County's Wind Resource Area which encourages development of wind energy operations. The project site is located within the Agricultural zoning district, and the County considers MEP to be a conditionally-permitted use within that zoning district. The 158-acre project parcel has had a 6.5 MW cogeneration facility (Byron Cogeneration) occupying approximately 2.0 acres of the property since 1992. In addition, the property contains remnants of prior wind turbine development (e.g., felled transmission poles) and other minor debris.

MEP will use water supplied by Byron Bethany Irrigation District (BBID) via a new, 1.8-mile pipeline. Approximately 0.7 miles of the northern extent of this pipeline will be located in Contra Costa County. The majority of the water supply pipeline would be located within Bruns Road right-of-way, a 1,000-foot section of the pipeline would be on BBID property, and an approximately 1,000-foot section of the pipeline would be on the project property.

MEP will require only a 0.7-mile, 230-kV transmission line that will run from the site north to the Pacific Gas and Electric Company's (PG&E) 230-kilovolt (kV) Kelso Substation. Additional overhead lines are consistent with the existing conditions. Natural gas would be delivered to the site via a new 580-footlong natural gas pipeline that would connect the project site to PG&E's Line 2, an existing high-pressure natural gas pipeline located northeast of the project site.

Existing natural gas and petroleum pipelines (Standard Pacific Gas Line Incorporated and Chevron Pipe Line Company) are located on the 158-acre MEP parcel, within a pipeline corridor that traverses the parcel from southeast to northwest. Both the project transmission line and water supply pipeline will cross these pipelines, requiring coordination with the pipeline owners. With the exception of remnant utility conduits associated with the abandoned wind farm, the Applicant is not aware of any subsurface utilities or pipelines located on the 10-acre MEP site.

Current Land Use Plans for the Study Area

The power plant site is located within unincorporated Alameda County. As such, the following documents were reviewed for project conformity:

- The East County Area Plan (ECAP)
- The Alameda County General Plan

The ECAP is the primary planning document applicable to the project site. While approximately 0.7 miles of the MEP's water supply pipeline will be located in Contra Costa County, as development of the project's waterline will not result in substantial long-term changes to the environment the land use analysis was restricted to Alameda County plans and ordinances. Similar information for Contra Costa County was provided for informational purposes.

B. Environmental Analysis

MEP was evaluated against CEQA Guidelines Appendix G, CEQA Checklist to evaluate the potential land use impacts associated with implementation of the project. For each of the

appropriate checklist criteria, it was determined that implementation of MEP would not result in significant land use impacts. Specifically it was determined that MEP does not:

1. Physically divide an established community within Alameda County or the adjacent counties of San Joaquin or Contra Costa. MEP will place a peaking power plant on 10 acres of a 158-acre parcel that is currently used for grazing and was formerly developed with a wind energy project. The project will not involve the displacement of any existing development, nor will it result in new development that would physically divide an existing neighborhood. The water supply pipeline will not physically divide established communities. The water line will be located within existing roadway rights-of-way, BBID property, and the project parcel.

2. Conflict with applicable land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect. The MEP site is situated on land designated as Large Parcel Agriculture by Alameda County. The proposed project is conditionally permitted under the Alameda County Zoning Ordinance "A" Zoning District. Alameda County would have exclusive jurisdiction over the project site, but for the CEC's exclusive jurisdiction under the Warren-Alquist Act. The MEP site is adjacent to an existing thermal cogeneration facility that was permitted by the county under a Conditional Use Permit and comprises thermal power generation and a process for wastewater distillation.

   The project is consistent with Alameda County policies for this area because it is a permitted use in the applicable land use designation, and because it will enhance agricultural production on the parcel via onsite mitigation. The project will be situated near, and be compatible with, similar uses. The project will be consistent with ECAP policies related to sensitive lands, sensitive viewsheds, transportation, services, infrastructure, and environmental health. MEP will not conflict with operations at nearby Byron Airport (eastern Contra Costa County), and will be compatible with ECAP policies related to transportation demand management and water use minimization. In letters dated May 20, 2010 and September 17, 2010, the Alameda County concurred with this conclusion.

   The current land use designations within 0.25 miles of the pipeline that extend into Contra Costa County include Agriculture Lands and Public/Semi-Public. The current zoning designations for this area are Heavy Agriculture (A-3 District) and Agriculture Preserve (A-4 District). Because the development of the project's waterline will not entail changes that will result in substantial long-term changes to the environment in Contra Costa County, only an encroachment permit will be required. Additionally, BBID will construct, own, and maintain the pipeline and associated pumping facilities, and therefore will be exempt from Contra Costa County zoning ordinance requirements.

3. Conflict with any applicable habitat conservation plan or natural community conservation plan. Alameda County does not presently have any approved regional habitat conservation or natural community conservation plans. Therefore, the project will not conflict with the goals of such a plan. The northern extent of MEP's water supply pipeline lies within Contra Costa County, and therefore falls inside the planning area of the East Contra Costa County Habitat Conservation Plan (HCP). MEP does not conflict with the HCP.

   MEP does fall within the coverage area of the East Alameda County Conservation Strategy (EACCS), which is currently being finalized. The Applicant will cooperate with local, state,

and federal interests when developing habitat avoidance, minimization, and/or mitigation. Covered wildlife species are also state or federally protected species; therefore the Applicant will consult with the U.S. Fish and Wildlife Service and/or the California Department of Fish and Game to address potential effects.

4. Fall within the category of lands designated for prime farmland, unique farmland, or farmland of statewide importance or includes any lands that have Williamson Act or Farmland Security Act contracts. The project will not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), to nonagricultural use and does not require the cancellation of a Williamson Act contract. While the MEP site is located on land that is currently under a Williamson Act contract, electric facility uses are expressly compatible with the Williamson Act, and the majority of the remaining parcel will remain in agricultural use. Alameda County and the California Department of Conservation concurred that MEP is a compatible use under the Williamson Act with the on-going agricultural activities occurring on the 158-acre parcel. The Applicant will also implement measures to increase the agricultural output on the parcel by supplying year-round cattle watering capability on the site, and re-seeding the 9.2-acre temporary construction laydown and parking area with grasses designed to improve food supply for the cattle. Impacts associated with the conversion of farmland to nonagricultural uses will be less than significant.

C. Cumulative Impacts

The CEQA Guidelines (Section 15355) defines cumulative effects as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Cumulative land use impacts could occur if the development of the project and other related past, present, and reasonably foreseeable probable future projects will be inconsistent with applicable plans and policies. The Applicant examined past, present and reasonably foreseeable projects currently underway or in planning phases within Alameda and San Joaquin Counties.

We agree with Staff that the MEP would not result in incremental land use-related impacts which would be cumulatively considerable.

D. Mitigation

No significant land use impacts are anticipated from implementation of the proposed project. Therefore, no additional mitigation measures are proposed, beyond the provisions for enhancing agricultural productivity of the parcel and the Conditions of Certification provided in the CEC Supplemental Staff Assessment (SSA). Project implementation will occur in compliance with all LORS applicable to the construction and operation of power plant facilities, including the ECAP. As proposed, project construction and operation is expected to comply with all Alameda County and CEC conditions of approval.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that four Conditions of Certification be adopted to address land use issues, LAND-1 through

LAND-4. The Applicant has reviewed Staff's proposed Conditions of Certification set forth in the SSA and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Land Use

Noise and Vibration

I. Introduction

A. Name: Mark Bastasch

B. Qualifications: Mr. Bastasch's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.7 Noise, dated June 15, 2009 [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.7 Noise, dated March 5, 2010 [Exhibit 6].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].
- Email Regarding MEP Noise Levels - Distance to 60 dBA, dated September 21, 2010 [Exhibit 50].
- Applicant's Comments on the Staff Assessment related to Noise, dated November 24, 2010 [Exhibit 61].

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The proposed 10-acre project site is located on a 158-acre parcel in unincorporated eastern Alameda County, California. The area is zoned for large parcel agriculture and the project site is within a designated Wind Resource Area. The proposed project site is directly south-southwest of the existing 6.5-megawatt (MW) Byron Power Cogen Plant, located on the same parcel. The larger 158-acre project parcel contains remnants of prior wind turbine development that has been removed except for minor debris. Wind energy installations are still active in the general area, as the Altamont Pass Wind Farm is approximately 1 mile southwest of the project area.

Uses closer to the project site include grazing, power generation, water management facilities, and recreation areas. The Pacific Gas and Electric Company (PG&E) Kelso Substation and Bethany Compressor Station are located directly north of the project parcel, along Kelso Road.

The primary source of noise in the area is traffic, both on local roads and near Segment B, I-580. The closest sensitive receptors to the MEP site include a few isolated residences, the closest of which is approximately 3,300 feet to the northwest from the center of the combustion turbines. A second residence is approximately 3,600 feet to the northeast, and a third residence is approximately 3,700 feet to the west. The nearest resident to the transmission line corridor is located at a distance of approximately 1,500 feet.

B. Construction Impacts

Construction of MEP is expected to be typical to other power plants in terms of schedule, equipment used, and other types of activities. The noise level will vary during the construction period, depending upon the construction phase. Construction noise may be audible at the nearest dwelling units but is not anticipated to dramatically exceed current exposure levels and the noisiest construction activities will be confined to the daytime hours.

Construction noise impacts potentially harmful to the health and hearing of construction workers will be reduced to a level below significance by preparation and execution of a Hearing Protection Plan, which complies with California Occupational Safety and Health Administration requirements.

Noise generated during the testing and commissioning phase of the project is not expected to be substantially different from that produced during normal full-load operation. Starts and abrupt stops are more frequent during this period, but on the whole they are usually short-lived. Temporary increases in noise levels above existing ambient levels during reconductoring may be noticeable beyond areas immediately adjacent to the rights-of-way; however, they will be temporary and no additional mitigation measures are proposed.

C. Operational Impacts

Outdoor levels throughout the plant will typically range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from any major noise source. A hearing conservation program will be developed to address potential noise impacts to operations personnel. Therefore, noise impacts to workers during operation will be less than significant.

Noise from the project, with noise control incorporated in the design, is predicted to not exceed 43 dBA at the closest residential receptors. This limit will comply with Alameda County's noise requirements which require noise to not exceed 45 dBA. Operational noise from MEP, with noise control incorporated in the design, is anticipated to comply with the proposed Conditions of Certification.

D. Summary of the Cumulative Impacts

At the time of AFC preparation, applications for six proposed projects had been filed in the area surrounding the project. With the exception of one project, the East Altamont Energy Center (EAEC), the planned projects are not uses that would be anticipated to add considerable noise sources to the area on a cumulative basis.

The EAEC, a 1,100-MW power plant project will be located approximately 1.5 miles northeast of the MEP site. Anticipated noise levels from the EAEC, when combined with MEP's noise levels, and then added to the nighttime existing ambient noise level results in 48 dBA L90. We agree with Staff that the combined result is less than significant.

Given the Conditions of Certification proposed for both MEP and the proposed EAEC, no significant noise or vibration cumulative impacts are anticipated to occur.

E. Mitigation

Proposed mitigation measures include establishment of a noise hot line throughout the construction and operation of the project, development of a noise complaint resolution procedure, and institution of equipment noise controls.

MEP and its linear facilities will be constructed in accordance with the proposed mitigation measures and Conditions of Certification. With the implementation of the proposed project mitigation measures and Conditions of Certification, construction and operation of the project will comply with all applicable laws, ordinances, regulations, and standards and will not result in a significant adverse noise impacts on people within the affected area, directly, indirectly, or cumulatively.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that six Conditions of Certification (COCs) be adopted to address noise and vibration issues, NOISE-1 through NOISE-6. The Applicant has reviewed the Staff's proposed COCs, and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Noise and Vibration

This page intentionally blank

Paleontological Resources

I. Introduction

A. Name: W. Geoffrey Spaulding, Ph.D.

B. Qualifications: Dr. Spaulding's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.8 Paleontological Resources, dated June 15, 2009 [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.8 Paleontology, dated March 5, 2010 [Exhibit 6].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].

D. Submitted With a Request for Confidential Treatment:

- Application for Confidential Designation - Paleontological Resources (Figure PAL-1), dated June 15, 2009.

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

The subsurface of the Mariposa Energy Project (MEP) site consists of Quaternary alluvium and colluvium derived by erosion of local outcrops of the Cretaceous Great Valley Sequence. The project linears also cross chiefly Quaternary alluvium. Quaternary sediments in the area warrant a "high" sensitivity rating in swales, and Cretaceous sediments of the Great Valley Formation have a "low" sensitivity rating in the area. Excavations extending to depths below 3 feet are likely to affect Quaternary-age sediments and excavations associated with all project components are likely to affect Cretaceous marine sediments. Prior to construction, a Paleontological Resources Monitoring and Mitigation Plan (PRMMP) will be developed. This PRMMP will include mitigation measures such as monitoring and the recovery and treatment of any discovered paleontological resources. Implementation of the PRMMP will mitigate impacts to paleontological resources that may result from construction.

No impacts to paleontological resources will result from the operation and maintenance of MEP.

III. Mitigation Measures

Mitigation measures included in the PRMMP include the designation of a Paleontological Resource Specialist (PRS), who will review excavation plans to determine where paleontologically sensitive stratigraphic units will be disturbed by project-related earth movement. These excavations will be monitored by a qualified paleontological monitor under direction of the PRS. Discovered paleontological resources will be scientifically recovered and documented and, should they be paleontologically significant, they will be curated into an accredited museum. Mitigation will also include a paleontological resources awareness module in the worker education for facility construction. These paleontological resource impact mitigation measures proposed in the AFC will reduce, to an insignificant level, the direct, indirect, and cumulative adverse impacts on paleontological resources that might result from project construction.

IV. Proposed Licensing Conditions

The Staff Assessment (SA) for the project filed by the CEC recommends that seven Conditions of Certification be adopted to address paleontological issues: PAL-1 through PAL-7. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

V. Correlation to SA and Hearing Topics

- Geology and Paleontology

Public Health

I. Introduction

A. Name: Keith McGregor and Jerry Salamy

B. Qualifications: The qualifications of the authors are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification (AFC), Volume 1, Section 5.9 Public Health; Volume 2, Appendix 5.9A HRA Data, Appendix 5.5A Offsite Sensitive Receptors, dated June 15, 2009 [Exhibit 1].
- AFC Health Risk Assessment Modeling Files, dated June 15, 2009 [Exhibit 3].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.9 Public Health, dated March 5, 2010 [Exhibit 6].
- Applicant's Data Response Set 1D, Response to CEC Staff & Data Request 56, dated March 31, 2010 [Exhibit 11].
- Staff Queries Set 1, Addenda to CEC Staff Data Request 52, dated June 18, 2010 [Exhibit 15].
- Mariposa Energy, LLC Letter to CEC re MHCSD Resolution R-MMX-4 Opposing the Project, dated April 8, 2010 [Exhibit 37].
- Preliminary Determination of Compliance, dated August 18, 2010 [Exhibit 46].
- Applicant's Comments on the Staff Assessment related to Public Health, dated November 24, 2010 [Exhibit 61].
- BAAQMD Final Determination of Compliance, dated November 24, 2010 [Exhibit 62].

To the best of our knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own based upon our professional judgment. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

We assessed the potential human health risks associated with the construction and operation of the Mariposa Energy Project (MEP or project). A human health risk assessment (HHRA) was

conducted using guidance developed by OEHHA, EPA, and ARB. The HHRA characterized potential public health impacts associated with the operation of MEP in terms of the following three categories: acute or short-term non-cancer health effects, chronic or long-term non-cancer effects, and excess cancer risk. According to the Bay Area Air Quality Management District (BAAQMD) Regulation 2, Rule 5, Best Available Control Technology for Toxics (TBACT) shall be applied to any new source of toxic air contaminants (TACs) where the excess cancer risk for each individual source is predicted to be greater than one in a million and the predicted incremental increase in cancer risk for the entire project must be less than 10 in 1 million individuals. A chronic hazard index less than 0.2 for each individual source and an acute or chronic hazard index of less than 1.0 for the entire project is also considered less than significant by BAAQMD. Therefore, we compared the results of the HHRA to the significance criteria established by BAAQMD.

Construction-Related Health Risk

Equipment and vehicles operating both onsite and offsite during the construction of the project will result in TAC emissions. However, the construction phase is expected to be temporary and finite in duration and the implementation of proposed mitigation measures are expected to reduce the potential public health impacts associated with construction to less than significant levels. This determination is consistent with the CEC Staff's determination in the Supplemental Staff Assessment. Therefore, activities associated with the construction of the project are not expected to cause a significant human health impact.

Operational Health Risk

Emissions of TAC from the four natural gas-fired combustion turbines and the diesel-fired fire pump were estimated using emission factors developed by the ARB, vendor estimates, and actual source test results. The hourly and annual emission rates were conservatively assumed based on the maximum fuel consumption and operating hours permitted for the turbines. The pollutant dispersion modeling and risk assessment were conducted following EPA, ARB and BAAQMD guidance. The dispersion modeling used meteorological data from the Patterson Pass meteorological station and a receptor grid out to 6 miles from the project site, which includes all existing and future Mountain House residential areas within the Mountain House Community Services District Local Agency Formation Commission (LAFCO) boundary. Discrete receptors were also included to assess the potential impacts for sensitive land uses such as schools, daycare facilities, elderly care facilities, and hospitals. The sensitive receptors included in the analysis consisted of five schools and twenty-three preschool or daycare facilities. Because the receptor grid included all areas outlined in the Mountain House LAFCO boundary, the potential impacts at the future Mountain House sensitive receptors have also been considered as part of this health risk assessment.

Results of the health risk assessment indicate that acute and chronic hazard indices are significantly less than 1, and that the excess cancer risk from the project at the nearest resident or offsite worker is less than 1 in a million. Therefore, the expected public health impacts are less than significant. These conclusions were confirmed by BAAQMD in the Final Determination of Compliance, which used a more conservative dispersion modeling methodology to arrive at this conclusion[1].

[1] BAAQMD used screening meteorological data as opposed to actual meteorological data in its HHRA.

III. Proposed Licensing Conditions

The CEC Supplemental Staff Assessment (SSA) for the project does not include any Conditions of Certification for Public Health.

IV. Correlation to SSA and Hearing Topics

- Public Health and Air Quality

This page intentionally blank

Socioeconomics

I. Introduction

A. Name: Fatuma Yusuf and Tom Priestley

B. Qualifications: The panel's qualifications are as noted in their resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.10 Socioeconomics; Volume 2 Appendix 5.10A Screening-level Environmental Justice Analysis, Appendix 5.10B Records of Conversation, dated June 15, 2009 [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.10 Socioeconomics, dated March 5, 2010 [Exhibit 6].
- Applicant's Data Response Set 1D, Response to CEC Staff & Data Request 56, dated March 31, 2010 [Exhibit 11].
- Applicant's R. Dighe Data Response Set 2, dated May 4, 2010. Response to Dighe Data Request 14 [Exhibit 13].
- Applicant's Comments on the Staff Assessment related to Socioeconomics, dated November 24, 2010 [Exhibit 61].

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

MEP will be located on approximately 10 acres of a 158-acre parcel in the northeastern corner of unincorporated Alameda. The parcel is south of Kelso Road and east of Bruns Road. I-580 is located approximately 3.5 miles to the south and the closest segment of the Byron Highway is approximately 2 miles to the northwest. The site is approximately 2.3 miles west of the San Joaquin County line, and 1 mile south of the Contra Costa County line.

Because the project is located near the boundary of Alameda, Contra Costa, and San Joaquin counties, the region of influence (ROI) for the MEP socioeconomic analysis comprises these three counties ("the 3-County Region").

B. Construction Impacts

Actual construction will take place over 14 months, from the second quarter of 2011 through the second quarter of 2012. Personnel requirements will be minimal during the mobilization and site grading period (the first 3 months of the construction period) and during the startup and testing period (the last 3 months of the construction period).

Available skilled labor in the 3-County Region was evaluated by surveying the Building and Trades Council and contacting the California Employment Development Department (CEDD). Both sources show that the workforce in the 3-County Region will be adequate to fulfill MEP's construction labor requirements. Therefore, MEP construction will not place an undue burden on the local workforce. In addition, the construction activity within the 3-County Region has been declining. This decline coupled with the increase in unemployment rates brought about by the recent and ongoing economic recession implies that there is surplus labor available to meet the construction workforce demands of MEP. Therefore, the project will have a less-than-significant impact on construction labor supply.

The cost of materials and supplies required for MEP's construction is estimated at approximately $185 million. The estimated value of materials and supplies that will be purchased locally during construction is $12.3 million (in 2008 dollars). MEP will provide an estimated $16.3 million in construction payroll, at an average rate of approximately $75 per hour including benefits. The anticipated payroll for employees, as well as the purchase of materials and supplies during construction, will have a beneficial impact on the area. Assuming, conservatively, that 90 percent of the construction workforce will reside in the 3-County Region, it is expected that approximately $14.7 million will stay in the local area during the 14-month construction period.

Construction activities will result in secondary economic impacts (indirect and induced impacts) within the 3-County Region. Indirect and induced employment effects include the purchase of goods and services by firms involved with construction, and induced employment effects include construction workers spending their income within the 3-County Region. The estimated indirect and induced employment within the 3-County Region is 142 and 87 jobs, respectively. These additional jobs result from the annual local construction expenditures, as well as monies spent by local construction workers.

Local construction expenditures also generate sales tax revenues for both the place of sale (assumed to be Alameda County), and the state. The expected total sales tax revenue is expected to be on the order of $1.2 million, with Alameda County receiving 1 percent, 7.25 percent going to the state, and special districts receiving 1.5 percent.

C. Operational Impacts

MEP is expected to employ eight full-time employees. Facility employees will typically be drawn from the local workforce. Consequently, no population increase is anticipated as a result of this project. There will be no significant adverse impact on local employment.

MEP operation will generate a small, permanent, beneficial impact by creating employment opportunities for local workers through local expenditures for materials, such as maintenance supplies and services. The annual operations and maintenance budget is approximately $1.6 million (in 2008$), all of which is estimated to be spent within the 3-County Region. These

additional jobs and spending will generate other employment opportunities and spending in the 3-County Region.

The annual local operations and maintenance expenditures are expected to generate $159,900 in sales tax revenues. Of this amount, $12,300 is assumed to go to the place of sale.

D. Environmental Justice

President Clinton's Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was signed on February 11, 1994. The purpose of this Executive Order is to consider whether a project may result in disproportionately high and adverse human health or environmental effects on any minority or low-income population.

The federal guidelines set forth a three-step screening process:

1. Identify which impacts of the project are high and adverse.
2. Determine whether minority or low-income populations exist within the high and adverse impact zones. According to the guidelines established by U.S. Environmental Protection Agency (EPA, 1996) to assist federal agencies to develop strategies to address this issue, a minority and/or low-income population exists if the minority and/or low-income population percentage of the affected area is 50 percent or more of the area's general population.
3. Examine the spatial distribution of high and adverse impact areas to determine whether these impacts are likely to fall disproportionately on the minority and/or low-income population.

A screening-level analysis of environmental justice is presented in Appendix 5.10A of Exhibit 1. According to that analysis, MEP does not create significant adverse impacts. Therefore, as there are no significantly adverse environmental impacts that are likely to fall disproportionately on minority and/or low-income members of the community, MEP does not present any environmental justice issues. This conclusion is confirmed in the CEC Staff's Supplemental Staff Assessment.

E. Cumulative Impacts

There are a number of projects that are either planned or currently under development in the vicinity of MEP. Although these proposed projects will require a labor supply for construction, there is a sufficient supply of skilled labor in the 3-County Region such that significant cumulative impacts are unlikely to occur as a result of labor demand from MEP combined with demand from other projects. Other kinds of cumulative socioeconomic impacts are also unlikely, as MEP's effects on housing, schools, and public services are negligible. For these reasons, MEP will not cause any adverse cumulative socioeconomic impacts.

F. Mitigation

Because the project has no significant socioeconomic or environmental justice impacts, no additional mitigation measures are required.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends one Condition of Certification (COC) be adopted to address socioeconomics and environmental justice issues; SOCIO-1. The Applicant has reviewed the Staff's proposed COC, and finds it acceptable.

IV. Correlation to SSA and Hearing Topics

- Socioeconomics and Environmental Justice

Soils

I. Introduction

A. Name: Jennifer Krenz-Ruark

B. Qualifications: Ms. Krenz-Ruark's qualifications are as noted in her resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Sections 5.11 Soils; Volume 2 Appendix 5.11 Soil Loss Estimates Calculations, dated June 15, 2009 [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.11 and Appendix A, dated March 5, 2010 [Exhibit 6].
- Data Response Set 1A & 1B, dated November 30, 2009. Responses to CEC Staff Data Requests 63 and 64 [Exhibit 7].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

Project Site

The proposed Mariposa Energy Project (MEP) is in unincorporated Alameda County, approximately 6 miles southeast of the town of Byron and 7 miles northwest of the city of Tracy. MEP is located on an approximately 10-acre portion of a 158-acre parcel south of the Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and 230-kilovolt (kV) Kelso Substation. The project area includes the MEP site, linear features (electrical transmission line, natural gas pipeline, water supply pipeline, and access road), and construction parking and laydown areas.

The proposed MEP site and most of the surrounding land is designated as Large Parcel Agriculture and is non-prime Grazing Land. The project site is located within the Agricultural zoning district. The 6.5-MW Byron Power Cogen Plant is northeast of the site on the same parcel.

Much of the land in the immediate area of the MEP site is in open space or grazing. Agricultural fields exist in the area, with the closest located approximately 0.7 miles to the east of the project site. Agricultural fields also exist approximately 1.4 miles to the north of the proposed project site, along the proposed water supply line route. These fields have been graded for irrigation and could support production of tomatoes, alfalfa, or some other crop.

The MEP gas line will run approximately 580 feet northeast of the site on the 158-acre parcel to the point of interconnection with PG&E's high pressure gas line. The 0.7-mile electrical transmission line connection will run north, across Kelso Road to the Kelso Substation. MEP service water will be provided via a new pipeline connection to the Byron Bethany Irrigation District (BBID) canal placed within and along the east side of Bruns Road. A portion of the water line and associated laydown area are located outside Alameda County, in Contra Costa County.

Soil and Agricultural Resources

The MEP site is in a part of Alameda County designated for Large Parcel Agriculture by the East County Area Plan (Alameda County, 2002)[1]. The MEP site is non-irrigated grazing land, portions of which were previously used for wind power generation. The MEP parcel is currently under a Williamson Act contract. Agricultural land use within 1 mile of the site consists primarily of dryland pasture, with the closest irrigated crops approximately 0.7 miles east of the project site. Agricultural fields also exist approximately 1.4 miles north of the MEP site, along the water supply pipeline route.

The soil mapping units in the project area vary from finer soils formed in residuum to coarser soils formed in alluvium. The soils range from well drained in the upland rolling portions of the project area, to moderately well and somewhat poorly drained in the more level areas of the project area.

The project area soils have been previously disturbed. The project site contains remnants of previous wind turbine development, as well as buried natural gas pipelines that run through the project area (and under the proposed transmission line and water supply pipeline). Because the site and project area have previously been disturbed, it is possible that soil conditions may vary slightly from those shown in the USDA-NRCS soil survey due to local grading.

The soils found in the MEP area are rolling, and range from 0 to 30 percent slopes. Soil textures throughout the project area are medium to fine grained with textures ranging from fine sandy loam to clay. The erosion potential of these soils will vary based on the wetness of the soil, soil compaction, sizes of soil particles, and other site-specific properties. Because of the sloping nature of the property, soils in the project area are expected to have a high water erosion potential and moderate wind erosion potential.

In addition, the soil survey indicates that many of the soils in the project area have a moderate to high potential for shrink and swell. These soils have the potential to be unsuitable for use as a bearing surface for foundations and pipelines. Additionally, material excavated in these soils may not be suitable for backfilling where subsequent soil movements could adversely affect constructed linear features. Refer to the project geotechnical investigation for an assessment of the shrink-swell capacity of the onsite soils.

---

[1] Alameda County. 2002 (updated from 1994). East County Area Plan – A Portion of the Alameda County General Plan.

Farmland Conversions

Mariposa Energy proposes mitigation to supply year-round cattle watering capability on the site after construction, along with re-seeding of the 9.2-acre temporary construction laydown and parking area with grasses designed to improve food supply for the cattle. This mitigation will result in an improved agricultural land use after construction.

Because the project area is not being cultivated, MEP does not result in the conversion of farmland to a non-farmland use. Additionally, the project site is more suitable for grazing than cultivation because of its sloping topography. Although 10 acres of the larger parcel will be removed from grazing production, the use is conditionally permitted and would be compatible with nearby uses. Because of the limited loss of grazing land, proposed improvements to grazing productivity, and lack of a conversion of farmland, impacts on agriculture will be less than significant.

B. Construction Impacts

Conditions that could lead to excessive soil losses are present at the project site and laydown areas so care must be taken to prevent soil erosion. Construction Best Management Practices (BMPs) will be implemented during construction in accordance with the stormwater pollution prevention plan (SWPPP) required for all construction projects larger than 1 acre by the Regional Water Quality Control Board (RWQCB). A drainage, erosion, and sediment control plan (DESCP) will also be developed and implemented to reduce the impact of runoff from the construction site. It is assumed that incorporation of the BMPs and the DESCP will control erosion from the site; therefore, impacts from soil erosion are expected to be less than significant. Monitoring will involve inspections to ensure that the BMPs described in the SWPPP/DESCP are properly implemented and effective.

With the implementation of appropriate BMPs that will be required under the General Permit for Stormwater, the total project soil loss is estimated to be 0.54 tons. This amount is considered to be minimal and will constitute a less-than-significant impact on soil resources. The estimate of accelerated soil loss by water is very conservative (overestimate of soil loss) because it assumes only a single BMP (silt fencing), whereas a SWPPP will require multiple soil erosion control measures.

With implementation of mitigation measures described below, the maximum predicted erosion of material from the site is estimated at 0.457 tons over the course of the project construction cycle, and impacts related to soil erosion from wind will be less than significant.

MEP will be constructed in an area that has likely experienced previous disturbance from the construction of the adjacent 6.5-MW Byron Power Cogen Plant and a wind turbine project that was previously located onsite. It is expected that limited portions of the MEP area would have experienced prior soil disturbance or compaction. In areas that are designated for permanent road beds, pipelines, and foundation areas for buildings, compactability of the soils will be an important issue for long-term stability of these features. Because most of the permanent MEP structures will be paved or otherwise protected after construction, the overall anticipated effects of compaction during construction are considered to be less than significant.

C. Operational Impacts

Operation of MEP would not result in impacts to the soil from erosion or compaction. Routine vehicle traffic during plant operation will be limited to existing roads, all of which are paved or covered in gravel. Standard operational activities should not involve the disruption of soil. Site grading and drainage will be designed to comply with all applicable laws, ordinances, regulations and standards. Therefore, impacts to soil from project operations will be less than significant.

In addition, nitrogen from MEP air emissions is expected to be negligible when compared to the nitrogen content in fertilizers that are likely already being applied nearby in cultivated fields. Therefore, it is assumed that the addition of small amounts of nitrogen to the area will result in a less-than-significant impact on soil-vegetation systems. Additional discussion regarding nitrogen deposition and impacts on biological resources in the area can be found in Section 5.2 of the AFC, Biological Resources.

D. Cumulative Impacts

Because MEP will not result in significant adverse impacts that cannot be mitigated, impacts from MEP will not likely combine with those from the projects being processed near the MEP site to result in cumulative significant impacts.

The project will have minimal effect on agriculture. Agriculture uses along the linear features will be restored to pre-construction condition after construction is complete. With the application of onsite construction BMPs, the project's expected impacts on soil erosion, sedimentation, and compaction are expected to be less than significant. The MEP site is surrounded by rural land use, and there are no plans for residential development nearby to the site in the near future. Therefore, the potential for cumulative impacts of the proposed MEP combined with other projects will be insignificant.

E. Mitigation

Erosion control measures are required during construction to maintain water quality, protect property, and prevent accelerated soil erosion and/or dust generation. Erosion and sediment control BMPs will be implemented to follow the progress of grading and construction throughout the entire construction period. Non-active areas will be stabilized approximately 14 days after construction in that portion of the site has ceased. The entire area will be regularly monitored for signs of erosion; areas will be revegetated as necessary to maintain adequate soil protection. Re-vegetating disturbed soil soon after construction is the most effective way to control erosion and can also be one of the least expensive stabilization measures. Disturbed areas that have not been re-vegetated will be stabilized with plastic covers, erosion control blankets, or mulch before rain events.

Construction and post-construction BMPs and stormwater monitoring protocols are identified in the Construction SWPPP and DESCP for the project. BMPs include erosion and sediment controls, tracking controls, stormwater diversion channels, wind erosion controls, and non-stormwater management. With implementation of the Construction and Industrial SWPPPs, DESCP, and other waste discharge requirements, impacts to soil resources are less than significant and no further mitigation is required.

Permanent erosion control measures on the site may include graveling, paving, installing drainage systems, and revegetation, as appropriate.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that five Conditions of Certification (COCs) be adopted to address soil and water resources issues, SOIL&WATER-1 through SOIL&WATER-5. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Soil and Water Resources

This page intentionally blank

Traffic and Transportation

I. Introduction

The testimony within this section pertains to road traffic and transportation issues. Separate written testimony has been prepared for aviation issues.

A. Name: Loren Bloomberg and Maly-Ann Bory

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.12 Traffic and Transportation, dated June 15, 2009 [Exhibit 1].
- Supplement A, Data Adequacy, Traffic and Transportation, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B, Additional Laydown Area Analysis, Section 3.12 Traffic and Transportation, dated March 5, 2010 [Exhibit 6].
- Applicant's Response to CEC Staff Requests, Data Response Set 1D, dated March 31, 2010. Response to Data Request 56 [Exhibit 11].
- Record of Conversation with Lisa Worrall, CEC Staff, and Bruce Jensen, Alameda County CDA, regarding the status of projects proposed in the vicinity of the Mariposa Energy Project site, dated April 15, 2010 [Exhibit 38].
- Comments on the CEC Staff Assessment, Traffic and Transportation, dated November 24, 2010 [Exhibit 61].

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

MEP will be located on a portion of a 158-acre parcel south of Kelso Road and east of Bruns Road in unincorporated Alameda County, California (Assessor's Parcel Number 099B-7050-001-10). The MEP site is located in the northeast corner of Alameda County, about 3.5 miles north of Interstate 205 (I-205) and I-580, and 2 miles southwest of Byron Highway.

The 10-acre MEP site will be located in the southern portion of the parcel. The 6.5-megawatt (MW) Byron Power Cogen Plant occupies 2 acres of the parcel northeast of the proposed MEP site. The Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and 230-kilovolt (kV) Kelso Substation are located directly to the north of the parcel. The site is accessed via Bruns Road.

B. Construction Impacts

During the peak construction phase, MEP is expected to generate approximately 159 two-way daily construction worker vehicle trips (there will be a maximum of 177 workers per day, but it was assumed that 10 percent carpool with other workers). To analyze the worst-case scenario, traffic impacts associated with peak construction traffic were analyzed. A quantitative traffic analysis was not conducted for the long-term operations phase because it will generate a very low volume of trips.

Based on the provided construction data, a total of approximately 18 delivery/haul truck trips will be made to the MEP site per day. Of these 18 delivery/haul truck trips, it was assumed that two truck trips will access and leave the site during the peak hours. The remaining truck trips will occur throughout the day. For purposes of this analysis, the truck trips were converted to passenger car equivalent (PCE) trips at a ratio of 1.5 passenger cars for each truck, consistent with the HCM 2000 guidelines. Using these assumptions, MEP will generate 186 daily passenger car-equivalent trips, with 165 trips occurring during each of the morning and evening peak hours.

The traffic impacts were assessed based on volume/capacity (v/c) ratios, daily volumes, and level of service (LOS). All study area roadway segments currently operate at an acceptable LOS according to the Alameda County East County Area Plan (ECAP) performance criteria. The segments of Bruns Road and Byron Highway that are in Contra Costa County currently operate at an acceptable LOS according to Contra Costa County performance criteria. Average daily traffic generated during the construction period was added to the existing traffic volumes on each highway and arterial segments; peak-hour traffic generated during the construction period was added to the existing traffic volumes on each freeway segment. The freeway, arterial, and highway segments will continue to operate at an acceptable LOS during construction.

The PM peak-hour traffic generated during the construction period was added to the existing turning movement counts on the analyzed intersections within the study corridor. All study area intersections except one will continue to operate at an acceptable LOS (LOS D or better) in the PM peak hour with the addition of MEP construction traffic. The West Grant Line Road/Midway Road intersection (currently operating at LOS F in the PM peak hour) will continue to operate at an unacceptable LOS. The average delay increases from 91.3 to 116.0 seconds, but this increase only affects 12 vehicles in the peak hour. Most of the vehicles at the intersection are traveling through on West Grant Line Road, and they will have zero or minimal delay. Therefore, the construction traffic will not create significant impacts on the overall operation of intersections.

Reconductoring the Kelso–Tesla 230 kV transmission line will not have a significant impact on traffic and transportation resources. The construction of the Project may temporarily affect Bruns and Christensen Roads, as well as Altamont Pass Road, Patterson Pass Road, Grant Line Road, and I-580, however, these traffic impacts would be site specific, temporary, and similar in

level to the discussion presented in the AFC. At most, the reconductoring will employ 15 to 20 workers. During reconductoring activities, workers would first meet at PG&E's substation facilities, then travel together in crew trucks and park adjacent to the construction corridor. As discussed in Section F, to mitigate any potential impacts, a traffic control plan (TCP) will be prepared. The TCP will be guided by the California Department of Transportation Manual on Uniform Traffic Control Devices and the Work Area Traffic Control Handbook. Implementation of the traffic control plan for the affected area for the short duration of construction in that area is adequate to minimize the traffic impacts to a less-than-significant level. As a result, any potential traffic and transportation impacts will be less than significant.

C. Operational Impacts

During operations, MEP is expected to generate no more than four vehicle trips per day during the daytime (three daily employees with an 8 AM-4 PM shift, and an operator with a 7 AM-7 PM shift). The operations-related and maintenance-related traffic associated with MEP is considered minimal, so no operations-related mitigation measures are required.

D. Cumulative Impacts

Based on available planning documents, the Green Volts Utility-Scale Solar Field (located on Kelso Road, across from the Tracy Substation) is the only project near the MEP site that could be built in the near future. According to the Initial Study for the Green Volts Utility-Scale Solar Field (ICF Jones & Stokes, 2008), construction was originally scheduled for spring 2009, but has still not been completed as of December 2010. Based on updated information from Alameda County Community Development Agency, the project is being redesigned and may require a new environmental review. This project is not expected to adversely affect traffic conditions when added to MEP construction-related traffic.

F. Mitigation

To address any potential traffic issues during construction, the construction contractor will be required to prepare a construction traffic control plan and construction management plan, also known as a TCP. The TCP will address timing of heavy equipment and building material deliveries, potential street and/or lane closures, signing, lighting, and traffic control device placement. Damage to any roadway caused by MEP construction traffic will be restored to or near its pre-existing condition. The construction contractor will work with the local agencies to prepare a schedule and mitigation plan for the roadways along the construction routes.

The construction of MEP will add a small amount of traffic to local roadways. MEP-related traffic increases will not result in significant impacts. Additionally, operations-related and maintenance-related traffic associated with MEP is considered to be minimal, so no operations-related mitigation measures are required.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that eight Conditions of Certification be adopted to address traffic and transportation issues: TRANS-1 through TRANS-8. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Traffic and Transportation

Aviation

I. Introduction

A. Name: Doug Urry, Gary Normoyle, C.P. Case Van Dam, Ronald Hess, Harry Shiu, Stephen Shaw, Wesley David Wardall, Douglas Moss, Barry Yurtis, Barbara Lichman, Marshall Graves, Andrew Solberg, Keith McGregor, Jerry Salamy

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.12 Traffic and Transportation; Volume 2, Appendix 5.12A FAA Notice Criteria Evaluation and Appendix 5.12B FAA Form 7460-1, dated June 15, 2009 [Exhibit 1].
- Supplement A, Data Adequacy, Traffic and Transportation, dated July 31, 2009 [Exhibit 5].
- Applicant's Supplement B, Additional Laydown Area Analysis, Section 3.12 Traffic and Transportation, dated March 5, 2010 [Exhibit 6].
- Applicant's Responses to CEC Staff Requests, Data Response Set 1A & 1B, dated November 30, 2009. Responses to Data Requests 51 through 55 [Exhibit 7].
- Applicant's Response to CEC Staff Requests, Data Response Set 1D, dated March 31, 2010. Response to Data Request 56 [Exhibit 11].
- Applicant's Staff Queries Set 1, Addenda to CEC Staff Data Request 52, Responses to Keith Freitas E-mail, CCC ALUC Letter, Hal Yeager Letter, and Contra Costa County Board of Supervisors Letter, dated June 18, 2010 [Exhibit 15].
- Staff Queries Set 2, Responses to Andrea Koch E-mail, dated August 9, 2010 [Exhibit 16].
- Letter from Contra Costa Planning Commission, dated April 6, 2010 [Exhibit 35].
- Record of Conversation with Lisa Worrall, CEC Staff, and Bruce Jensen, Alameda County CDA, regarding the status of projects proposed in the vicinity of the Mariposa Energy Project site, dated April 15, 2010 [Exhibit 38].
- Comments on the CEC Staff Assessment, Traffic and Transportation, dated November 24, 2010 [Exhibit 61].

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

The Mariposa Energy Project (MEP) is a gas-fired power plant which emits thermal plumes. Both the Federal Aviation Administration (FAA) and the CEC Staff have assessed the potential impact of these thermal plumes on aviation. Both the FAA and the CEC Staff have recommend certain conditions for this Project, and conclude that

with implementation of these conditions, impacts to aviation resulting from the operation of MEP would be less than significant. For the specific plumes generated by MEP, the FAA, in its Determinations of No Hazard to Air Navigation for the four (4) stacks, specifically address the potential impact of the thermal plumes eminating from these stacks on aviation, and conclude that these plumes do not present a Hazard to Air Navigation. The FAA recommends that the Applicant work with the Byron Airport authority to provide educational materials about the potential plumes to pilots and to provide the MEP location and avoidance information in the Airport / Facility Directory. The CEC Staff recommends similar mitigation. The Applicant supports these recommendations.

The Applicant agrees with the findings of the FAA and the Staff that with the implementation of these conditions, MEP will not pose a Hazard to Air Navigation. In addition to the analyses performed by the FAA and the CEC Staff, the Applicant has commissioned extensive studies of the thermal plumes and aviation. These studies, as discussed in Section III of this testimony, confirm that MEP will have no adverse impact on aviation.

III. Setting

The Project is located approximately 2.7 miles southeast of the Byron Airport, which is located in neighboring Contra Costa County. The Project is nestled in a valley between high voltage power lines to the east and west, and is neither directly under nor adjacent to established Byron Airport traffic patterns.

IV. The FAA has exclusive jurisdiction and control over all matters relating to aviation safety.

A. The Federal Government has Exclusive Jurisdiction Over Aviation Matters.

Under Federal law, once an aircraft's wheels leave the ground, the Federal Aviation Administration ("FAA") has exclusive jurisdiction and regulatory control over all matters relating to the safety of the aircraft. "The U.S. government has exclusive sovereignty of the airspace of the United States."[1] In exercising that "exclusive sovereignty," the FAA is tasked with developing "plans and policies for the use of navigable airspace and assign[ing] by

[1] 49 U.S.C. § 40103(a)(1) ("Federal Aviation Act"), as amended.

regulation or order the use of the airspace necessary to ensure the safety of aircraft and efficient use of airspace."[2] The scope of the mandated air traffic regulations is broad, including, but not limited to, "(B) protecting individuals and property on the ground; (C) using the navigable airspace efficiently; and (D) preventing collision between aircraft and land or water vehicles, and between aircraft and airborne objects."[3] Thus, the breadth of Federal power leaves no room for state law determinations concerning aviation safety that conflict with FAA determinations.

Because Federal jurisdiction over the regulation of airspace is exclusive, it also expressly preempts state and local regulations in the area of safety of both aircraft and persons on the ground. "Under the doctrine of preemption, Federal law prevails over state law if Congress has expressed an intent to occupy a given field in which Federal law is supreme."[4]

In the context of airports and aviation, Congress has legislated, and the courts have found, both express and implied Federal preemption in all matters related to regulation of navigable airspace and aircraft safety. Express preemption arises first out of the Federal Aviation Act of 1958,[5] in which Congress conclusively stated its intention that "The U.S. Government has exclusive sovereignty of the airspace of the United States."[6] Since its passage, courts have consistently held that the Federal Aviation Act also "preempts the entire field of aviation safety through implied field preemption,"[7] *i.e.*, Congress' intent is expressed implicitly in the statute's structure and purpose.[8] Moreover, courts have further held that "the FAA and the regulations promulgated pursuant to it establish complete and thorough safety standards for air travel, which are not subject to supplementation by, or variation among, state laws,"[9] and that "the regulations enacted by the Federal Aviation Administration, read in conjunction with the FAA [Federal Aviation Act] itself, sufficiently demonstrate an intent to occupy exclusively the entire field of aviation safety and carry out Congress' intent to preempt all state law in this field."[10]

The FAA has set acceptable parameters for the height and location of land uses surrounding airports for the purpose of "establishing standards for determining obstructions to navigable airspace,"[11] as well as "requirements for notice to the Administrator of certain proposed construction or alteration;"[12] "aeronautical studies of obstructions to air navigation, to determine their effect on the safe and efficient use of airspace,"[13] and "public hearings on the hazardous effect of proposed construction or alteration on air navigation."[14] Where, as here, the FAA has made a finding that the parameters of a structure do not constitute an obstruction to

---

[2] 49 U.S.C. § 40103(b)(1).
[3] 49 U.S.C. § 40103(b)(2)(B)-(D).
[4] *Bethman v. Ukiah*, *216 Cal.App.3d* 1395, 1405 (1989).
[5] 49 U.S.C. § 40101, et seq.
[6] 49 U.S.C. § 40103(a)(1).
[7] *See, e.g., Montalvo, supra*, 508 F.3d at 468.
[8] *Cippollone v. Liggett Group, Inc.*, 505 U.S. 504, 516 (1992).
[9] Id.
[10] *Montalvo, supra*, 508 F.3d at 464.
[11] 49 U.S.C. § 44718; 14 C.F.R. Part 77, § 77.1(a).
[12] FAR Part 77, § 77.1(b).
[13] FAR Part 77, § 77.1(c).
14FAR Part 77, § 77.1(d).

airspace or hazard to aircraft and their occupants, that finding is conclusive with respect to aviation issues,[15] because FAA regulations have the force of law.[16]

Case law, moreover, consistently acknowledges complete Federal preemption over state and local regulation of airports and aircraft operations. "Federal sovereignty of the airspace of the United States is exclusive." *City of Burbank v. Burbank-Glendale-Pasadena Airport Authority*, 72 Cal.App.4th 366, 379 (1999), *citing* 49 U.S.C. § 40103(a)(1). "The Federal Aviation Administration has the sole authority to regulate the use of airspace as necessary to ensure its efficient use and the safety of aircraft." *Id.*, *citing* 49 U.S.C. § 40103(b)(1). In *San Diego Unified Port District v. Gianturco*, 651 F.2d 1306 (1981), the Court of Appeals entered an injunction against the California Department of Transportation, preventing enforcement of a flight curfew at Lindbergh Field. The court held that it did so based on the Quiet Communities Act of 1978, Pub.L. No. 95-609, 92 Stat. 3079 (1978),[17] and reached the conclusion that "Federal authority preempted local control of the sources of aviation noise. We hold that Congress intended to continue such preemption." *Gianturco, supra*, 651 F.2d at 1313. Finally, the *Gianturco* court noted that other Congressional acts "indicate a continuing intent to preclude local regulation" citing the Noise Abatement Act of 1979, Pub.L. No. 96-193, 94 Stat. 50 (1980) (codified in various sections of the Federal Aviation Act), the Airline Deregulation Act of 1978, Pub.L. No. 95-504, 92 Stat. 1708 (1978) (also codified in various sections of the Federal Aviation Act).

California State law expressly acknowledges the pre-emptive jurisdiction of the FAA over all matters relating to air navigation. Public Utilities Code section 21240 states: "[T]his state recognizes the authority of the federal government to regulate the operation of aircraft and to control the use of the airways, and nothing in this Act shall be construed to give the Department [of Aviation] the power to so regulate and control safety factors in the operation of aircraft or control use of airways."[18]

In summary, the safety of aviation in general, and pilots in particular, lies within the exclusive jurisdiction of the FAA, pursuant to Federal statutes, regulation and longstanding judicial precedent. Where the FAA has conclusively determined that a project does or does not pose a hazard to air navigation, no state or local agency has authority to make contrary findings. Just as the CEC preempts local jurisdictions with respect to the siting of thermal power plants and related facilities, the FAA pre-empts State authorities with respect to the question of whether such facilities may impact air navigation.

B. The FAA has determined that the structures and plumes will not pose a hazard to aviation.

The FAA issued Determinations of No Hazard to Air Navigation to MEP during the period from July 29, 2009, through October 06, 2009 for the Project's four exhaust stacks and eight power poles. In the Determinations for the four exhaust stacks, FAA Flight Standards Division addressed the issue of thermal plumes. The Determination of No Hazard states: "The Mariposa Energy Plant (MEP) will be located just over 2 miles southeast from the Byron Airport, a civilian public-use general aviation landing area, that includes ultralight and glider activity. Potential plumes emanating from the MEP stacks may not be readily visible. MEP is encouraged to work with the Byron Airport authority to develop pilot education material for local distribution

15FAA Order JO7400.2G, § 5-1-2.a.

16*Bethman, supra*, 216 Cal.App.3d at 1404.

17 The Quiet Communities Act was subsequently codified into various sections of the Federal Aviation Act, 49 U.S.C. § 40103, et seq.

18Cal. Pub. Util. Code § 21240.

identifying the location of the MEP facility and provide information on plume eflux rates at various altitudes at least as high as 1000 feet above the source. It is also suggested that the Byron Airport authority, through the FAA Airports District Office (ADO) provide the MEP location and avoidance information in the listing for Byron Airport contained in the Airport/Facility Directory (AFD)."

C. Independent analyses confirm that thermal plumes will pose no hazard to aviation.

1. FAA Analysis

As noted above, the FAA has issued Determinations of No Hazard to Air Navigation for the four exhaust stacks. As part of the associated FAR Part 77 Aeronautical Study, the FAA Flights Standards Division also assessed the potential of MEP's thermal plumes to impact aviation, including ultralight and glider activity. The FAA Determination makes specific recommendations regarding pilot education and providing location and avoidance information to pilots. To the best of our knowledge, this is the first time the FAA has expressly addressed thermal plumes in a Determination of No Hazard to Air Navigation. The Notice clearly reflects the FAA determination that, with implementation of the FAA recommendations, neither MEP's structures nor plumes pose a hazard to general aviation, including gliders and ultra-lights.

2. CEC Staff Analysis

"Energy Commission staff calculated plume vertical velocities at different heights above the MEP's stacks, using environmental conditions which would produce the worst-case, highest velocity plumes. These environmental conditions include calm winds, cool weather, and full-load operation of the MEP. The MEP, a peaker plant projected to operate for about 600 hours annually (but permitted for up to 4,000 hours annually), would only operate at full-load when electrical demand is high. This usually occurs when the use of air conditioning is greatest, typically during the summer. During the summer, temperatures are warmer and winds in the area are greater, and neither of these conditions contributes to a worst-case vertical plume velocity."

"From these calculations, staff determined that when the outside (ambient) temperature is 46 degrees Fahrenheit, the plume vertical velocity for a single plume would be 4.3 m/s or higher up to a height of 780 feet above ground level (AGL). At this same temperature, the combined plume vertical velocity for all four exhaust stacks would be 4.3 m/s or higher up to a height of 1,230 feet AGL."

"[T]he site is not within or immediately adjacent to any published approach/departure patterns or the traffic pattern for the airport. Even allowing for drift and expansion of the potentially affected area due to merged plumes, the area of potential hazard would not encroach on any established approach/departure or traffic pattern. In addition, the number of aircraft traversing the site is relatively low, even when compared to traffic in the surrounding area. The airspace above and immediately surrounding the project site is not an established student pilot training area or designated jump site, and does not show extensive use by ultralights or gliders. The elevation of the terrain east of the project site rises sharply and there are transmission lines and other structures that discourage low altitude flight in the project vicinity. There are also no noise or other restrictions that would

force pilots to overfly the project site in order to execute approach or departure procedures, or enter the pattern."

Therefore, consistent with the FAA, Staff proposed Condition of Certification **TRANS-8 to** provide a means to advise pilots of the potential hazard to flight associated with the project-generated exhaust plumes and the need to avoid overflight of the facility below 1,500 feet AGL. These measures would include requests for the issuance of a Notice to Airmen (NOTAM); amendment of the Airport/Facility Directory; revision of the San Francisco Sectional Aeronautical Chart; and addition of a new remark to the Automated Surface Observing System (ASOS)."

"With these mitigations," Staff concluded, "impacts to aviation would be less than significant."

3. Applicant's Analyses

The Applicant commissioned several studies to further assess potential impacts to aircraft flying in the vicinity of the Project. These studies confirm that thermal plumes generated by MEP will not pose a hazard to aviation.

a. Katestone Environmental Assessment of Vertical Plume Velocities

The Applicant commissioned Katestone Environmental to perform an Assessment of Vertical Plume Velocities for MEP, dated October 12, 2009. Also at the Staff's request, the Applicant commissioned an updated Assessment of Vertical Plume Velocities from Katestone for MEP (Attachment DR52-6). This assessment, dated April 30, 2010, expands upon, but does not differ in conclusion from, the prior assessment dated October 12, 2009.

This updated assessment provides a calm wind analysis (zero wind) in addition to the Australian Civil Aviation Authority (CASA) methodology using The Air Pollution Model (TAPM) to simulate hourly meteorological conditions over a year.

Based on its original and updated Assessment, Katestone concluded:

- The average plume vertical velocities generated by MEP are unlikely to exceed the CASA threshold of 9.6 mph above a height of 1,300 feet above ground level.
- The average plume vertical velocities generated by MEP are unlikely to exceed the threshold of light turbulence (13.6 mph) above a height of 700 feet above ground level.
- At the Flight Pattern Altitude of 950 feet above ground level, the average plume vertical velocity is predicted to be above the threshold velocity of 9.6 mph for only 26 hours of the year, and never above the vertical velocity of 13.6 mph, the upper limit of light turbulence.
- The average plume vertical velocities are likely to be below 9.6 mph under all meteorological conditions at a horizontal distance of approximately 300 feet from MEP's stacks.

- The average plume vertical velocities are likely to be below 13.6 mph under all meteorological conditions at a horizontal distance of approximately 100 feet from MEP's stacks.
- At no time will the cooling fans for the air cooled refrigeration condenser result in a plume exit velocity exceeding 9.6 mph.
- Assuming a worst case calm, zero mph, wind scenario the maximum height at which the average plume velocity is reduced to below the threshold velocity of 9.6 mph is 1841 feet and a velocity of 13.6 mph at 307 feet above ground level.

b. Computation Fluid Dynamics Turbine Exhaust Velocity Characterization
The Katestone Environmental analysis following the CASA methodology does not provide detailed three-dimensional plume characteristics to assess plume velocities at discrete points; rather this methodology determines average vertical velocities at a given height.

Computational fluid dynamics (CFD) mathematical modeling methodologies can be used to simulate detailed plume characteristics spatially. At the request of the Applicant, CH2M HILL prepared a Turbine Exhaust Velocity Characterization analysis using CFD (Attachment DR52-7). This analysis characterized MEP exhaust plume parameters (vertical velocity, temperature, and oxygen [O2] content) under 5 mph and 10 mph wind conditions, for ambient temperatures of 59 and 112 degrees Fahrenheit (°F). At these conditions, peak vertical plume velocities (at any discrete point in the plume) of 9.6 mph and 13.6 mph did not exceed 760 feet AGL and 142 feet AGL, respectively. The plume temperatures were found to cool to within 20°F of the ambient temperature within 361 feet AGL. Oxygen level at the stack discharge was given as 14.5 percent (70 percent of ambient levels), and was found to increase to 20 percent (95 percent of ambient levels) within 160 feet AGL. These data were used to develop responses to several of the Staff Queries addressed in subsequent sections of this document.

Additionally, CH2M HILL prepared a CFD analysis of the vertical velocity profile across the MEP plumes using the Katestone Environmental TAPM meteorological parameters associated with the maximum 1-hour plume height, for comparison of the CFD and TAPM methodologies. This analysis was conducted across the plume at 950 feet AGL (Flight Pattern Altitude), and 1,309 feet AGL (greatest height predicted by TAPM at which average vertical velocity of the plume equals or exceeds 9.6 mph). This analysis demonstrated that the two methodologies produce very similar results for average plume velocities at these elevations, and also provided cross-section plume velocity profile data for perpendicular paths through the plume at these elevations. These cross-section plume velocity profile data were used in the analysis of plume impacts on various airframes, as discussed below.

c. Aircraft Engine Oxygen Requirement Assessment
An analysis of aircraft engine oxygen requirements was prepared by Senta Engineering, LLC, in association with the Department of Mechanical and Aeronautical Engineering at UC Davis.

The report indicates that, based on an exhaust stack concentration of 14.5 percent oxygen, both reciprocating and turbine aircraft engines can operate in the exhaust plume with minimal effects from oxygen reduction.

d. Plume Effects on Aircraft Loads and Handling

The Applicant commissioned a study of the vertical loads imposed on the aircraft by the vertical velocity of the plumes, and the potential for roll upset of the aircraft if it happens to pass partially through the plumes (e.g., only the left half of the aircraft or only one wingtip). The study was performed by Senta Engineering, LLC. Senta Engineering provides engineering consulting services with expertise in aeronautics, renewable energies, and information systems. Senta's project analysis team has a combined experience exceeding ninety years; Senta's principals have conducted design, testing, analysis, and education for international technology developers and manufacturers and a wide array of government agencies and labs.

Senta evaluated the effect of the MEP plume on aircraft loads and handling. Aircraft were assumed to be in an approach for Byron Airport at an altitude of 1079 ft above mean sea level (954 ft above ground level at the MEP site) and in a landing configuration (if applicable). Winds were assumed to be calm.

The loads imposed on aircraft by the vertical velocity of the plumes were evaluated for a Cessna Citation II, Cessna 172, Vans RV-6, and a powered parachute. Conservative estimates for a variety of aircraft indicate that loads imparted by the worst-case plume are 0.24g to 0.67g. Powered parachutes, due to their relatively slow speeds, would experience a light level of turbulence. These loads are well within the prescribed operating load limits of the aircraft. Therefore, Senta concluded that aircraft transiting the plume would experience no detrimental structural effects since they are operating within certified structural limits.

An aircraft flying through the plume may encounter an asymmetric vertical velocity gradient across its wingspan which imparts a rolling moment on the aircraft. This potential for roll upset was evaluated on a Cessna 172, Beech 99, and Learjet 24. For these aircraft, the aileron input required to counter the roll upset imparted by the MEP plume was between 5.0° and 6.7°, well within aileron operating limits of 17.0° and 19.0°.

In summary, Senta's analysis demonstrates that if an aircraft were to overfly MEP, notwithstanding a regulatory NOTAM advising against overflight at an altitude of 954 AGL, during calm wind conditions which have been found to occur in only 26 out of 8,760 hours in the worst meteorological year studied, and assuming full power operation of MEP, the aircraft would experience a light to moderate level of turbulence that would cause no detrimental structural effects on the aircraft and which would be well within aileron operating limits for correction of any rolling moment.

e. Pilot Exhaust Exposure Analysis

The Applicant also conducted an analysis of the potential health impacts that could be experienced if pilots flew directly through the MEP exhaust plumes. The potential health impacts were evaluated based on a comparison of both the exhaust concentration at the stack tip and the diluted exhaust concentrations to safe exposure limits established by the Occupational Safety and Health Administration (OSHA), the National Institute for

Occupational Safety and Health (NIOSH), the American Conference of Industrial Hygienists (ACGIH), the Agency for Toxic Substances and Disease Registry (ATSDR), and the Office of Environmental Health Hazard Assessment (OEHHA). The potential exhaust characteristics at various heights were predicted based on the TAPM and CFD modeling conducted by Katestone Environmental and CH2M HILL.

The results of this analysis show that if a pilot were to pass through the MEP plume at the lowest expected elevation, no adverse health impacts would occur because the predicted pilot exposure would be significantly less than the recognized worker/public safety standards published by OSHA, NIOSH, ACGIH, ATSDR, and OEHHA.

V. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that eight Conditions of Certification be adopted to address traffic and transportation issues: TRANS-1 through TRANS-8. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

VI. Correlation to SSA and Hearing Topics

- Traffic and Transportation

This page intentionally blank

Visual Resources

I. Introduction

A. Name: Thomas Priestley and Josh Hohn

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.13 Visual Resources; Volume 2, Appendix 5.13A Visible Plume Assessment, dated June 15, 2009 [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.13 Visual Resources, dated March 5, 2010 [Exhibit 6].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].
- Applicant's Comments on the Staff Assessment related to Visual Resources, dated November 24, 2010 [Exhibit 61].

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

Description of the Visual Setting

The project is proposed to be developed on a 158-acre parcel in the unincorporated northeastern corner of Alameda County near the rural Mountain House community. The project site is approximately 1 mile south of the Contra Costa County border and approximately 2.5 miles west of the San Joaquin County border. The unincorporated Mountain House Community Services District is located in San Joaquin County and is the closest urbanized area. Livermore, located approximately 7 miles to the southwest in Alameda County, is the nearest incorporated city to the project site.

The land surrounding the project site is mostly grassy and hilly, and the area is characterized by agricultural, power generation, and water management facilities. The project site is located within land that is designated for large parcel agricultural uses, and grazing occurs on most of the land within a mile radius of the project site. The landscape includes several prominently

visible infrastructure facilities. Rural residential and recreational uses are also located in the area. Mountain House School, an elementary school, is located approximately 1.3 miles east of the project site, along Mountain House Road.

Various energy infrastructure facilities exist in the vicinity of Mariposa Energy Project (MEP). The Byron Power Cogen Plant is northeast of the project site on the same parcel. The Pacific Gas and Electric Company (PG&E) Kelso Substation and Bethany Compressor Station are located approximately 0.3 miles to the north of the project site, along Bruns Road. Farther east on Kelso Road is the Western Area Power Administration (WAPA) Tracy Substation, approximately 1 mile away. Wind energy installations, highly visible in the hills to the west, are active in the general area; the closest of these, the Altamont Pass Wind farm, lies approximately 1 mile to the southwest of the project area.

Various water infrastructure facilities exist in the vicinity of MEP. The California Department of Water Resources Delta Pumping Plant is located approximately 1 mile to the northwest of the project site, near the end of Kelso Road and midway along the California Aqueduct between Clifton Court Forebay and Bethany Reservoir. The Delta-Mendota Canal is approximately 0.7 miles to the east of the project site, and the Tracy Pumping Plant, managed by the U. S. Bureau of Reclamation, is located approximately 1 mile northeast of the project site, along Kelso Road. The Bethany Reservoir State Recreation Area is approximately 0.7 miles southwest of the proposed project site.

Population density in the vicinity of the project site is low, with fewer than a dozen residences located within 1 mile of the proposed MEP location. Most of these residences are scattered along Kelso Road northeast of the project site. Among the closest residences is a small cluster of homes approximately 0.6 miles away from the project site. Residences associated with agricultural uses are also located to the west of the project site.

There are no officially designated State Scenic Highways in the vicinity of the project site. Mountain House Road, a road that runs north/south approximately 1.3 miles east of the project site, is identified as a Major Rural Road in the Scenic Route Element of the General Plan of Alameda County (Alameda County, 1994)[1].

Description of the Project

The Applicant proposes to develop a natural gas-fired, simple-cycle electric generating facility called the MEP. As proposed, the project would have four power blocks producing a total capacity of 200 megawatts (MWs). The project's equipment would include four GE LM6000 PC-Sprint Combustion Turbine Generators and an air-cooled condenser.

The MEP site occupies 10 acres of the 158-acre parcel within which it is located. The majority of the 10 acres are located in a northeast-southwest oriented hollow, between hills to the east and west. The site is accessed via an approximately 1,100-foot-long road that extends from a main entrance along Bruns Road. This easement also provides access to the 6.5-MW Byron Power Cogen Plant, a small cluster of structures that occupies 2 acres to the immediate northeast of the project site. The portion of the parcel that includes the project site contains remnants of prior wind turbine development that has been removed except for minor debris.

[1] Alameda County. 1994 (updated from 1966). Scenic Route Element of the General Plan.

Several transmission lines are present in the vicinity of the project site. A 230-kilovolt (kV) line and a 60-kV line run along Bruns Road west of the project site. At its closest point, the 230-kV line is less than 600 feet away from the project site, though the two are separated by a hill. To the east, two 500-kV lines run parallel to each other, in a generally north-south orientation. These lines are approximately 1,200 feet away at their closest point to the project site. MEP will require a new natural gas tie-in to a nearby gas pipeline, and a new transmission line to the Kelso Substation, approximately 0.5 miles north of the project site. A 1.8-mile-long water supply pipeline will connect to the site from the Bethany Byron Irrigation District (BBID) Canal 45, located north of the project site in Contra Costa County.

B. Impacts of the Project

We agree with Staff's conclusion that the proposed MEP would not create substantial adverse impacts under the California Environmental Quality Act pertaining to Aesthetics with the effective implementation of the conditions of certification proposed by the Applicant and recommended by Staff.

Staff conclusions of Visual Resources impacts for MEP are summarized below:

1. The proposed project would not have a substantial adverse effect on a scenic vista.
2. The proposed project would not substantially damage scenic resources.
3. The proposed project would not substantially degrade the existing visual character or quality of the site and its surroundings as shown in KOP 1 through KOP 5.
4. The proposed project would not emit publicly visible water vapor plumes during normal operation and normal weather conditions based on the Applicant's proposed facility design.
5. The proposed project would not create a new source of substantial light or glare that would adversely affect daytime or night time views.

C. Cumulative Impacts

We agree with Staff that the incremental effect of the project, combined with the effects of the other projects within the geographic scope identified in the cumulative analysis would have a less than significant cumulative impact on visual resources.

D. Compliance with Applicable LORS

We agree with Staff that the proposed project would be consistent with all applicable laws, ordinances, regulations, and standards (LORS) pertaining to aesthetics, or preservation and protection of sensitive visual resources with the effective implementation of the conditions of certification.

E. Mitigation

No significant visual impacts will result from implementation of the proposed project. Therefore, no mitigation measures are proposed by the Applicant or by Staff. However, project implementation will be subject to county planning regulations. Specifically, a Landscape Plan will be prepared and submitted to the county for review and comment and to the CEC Compliance Project Manager for review and approval before construction begins. The site plan

will comply with all applicable provisions of the Alameda County Zoning Ordinance and General Plan, including provisions related to landscaping and project appearance.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends six Conditions of Certification (COCs) be adopted to address visual resource issues. The Applicant has reviewed the Conditions of Certification (VIS-1 through VIS-6) set forth in the SSA and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Visual Resources.

Waste Management

I. Introduction

A. Name: Doug Urry

B. Qualifications: Mr. Urry's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification; Volume 1, Section 5.14 Waste Management; Volume 2, Appendix 5.14A Phase I Environmental Site Assessment [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.14 Waste Management, dated March 5, 2010 [Exhibit 6].
- Data Response Set 1A & 1B, dated November 30, 20019. Responses to CEC Staff Data Requests 16, 17, 40, 41, 61, 62, 66, and 68 [Exhibit 7].
- Applicant's Data Response Set 1D, dated March 31, 2010. Responses to CEC Staff & Data Request 56 [Exhibit 11].

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The Mariposa Energy Project (MEP) will be located in northeastern Alameda County, California, on a 10-acre portion of a 158-acre parcel immediately south of the Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and 230-kilovolt (kV) Kelso Substation.

In June 2008, CH2M HILL, on behalf of Mariposa Energy, LLC, prepared a Phase 1 ESA for the proposed site in accordance with the American Society for Testing and Materials (ASTM) Standard E 1527-05, Standard Practice for Environmental Site Assessments**.** Although only a portion of the subject property will be used for the 10-acre power plant site, the Phase I ESA covered the entire subject property to allow for flexibility in site selection.

Per the ESA, no stained or suspect soil was observed at the site and the facility is not identified on any of the federal and state environmental databases. Further, MEP would not be affected by any of the 68 listed sites within Alameda or San Joaquin counties. The Phase I ESA revealed no

evidence of historical or existing recognized environmental conditions (RECs) at the site but did identify two areas of environmental concern because of historical uses on the 158-acre parcel, neither of which are expected to affect MEP development:

- Historical, long-term use of the subject property as a power generation facility (Byron Power), potentially resulting in contamination of soil and groundwater by potential spills or releases from chemical compounds used onsite.
- Historical, long-term use of adjacent properties as stockyards, potentially resulting in contamination of soil and groundwater by nitrate from concentrated manure.

B. Construction Impacts

Both hazardous and non-hazardous waste will be generated during the construction and operating phases of the facility. During construction, the primary waste generated will be solid nonhazardous waste. However, some nonhazardous liquid waste and hazardous waste (solid and liquid) will also be generated. Nonhazardous solid waste streams that could be generated include paper, wood, glass, and plastics, concrete, and metal. Nonhazardous wastewater will be generated, including sanitary wastewater, equipment washdown water, stormwater runoff, and water from excavation dewatering during construction (if dewatering is required). Depending on the chemical quality of these wastewaters, they could be classified as hazardous or nonhazardous. The wastewaters would be sampled and, if they are hazardous, would be disposed of at an approved facility.

Most of the hazardous waste generated during construction will consist of liquid waste, such as flushing and cleaning fluids, passivating fluid (to prepare pipes for use), and solvents. Some hazardous solid waste, such as welding materials and dried paint, may also be generated. The construction contractor will be considered the generator of hazardous construction waste and will be responsible for proper handling of the waste in compliance with all applicable federal, state, and local laws and regulations including licensing, training of personnel, accumulation limits and times, and reporting and record keeping.

C. Operational Impacts

During MEP operation, the primary waste generated will be nonhazardous solid waste. However, varying quantities of both solid and liquid hazardous waste will also be generated periodically. MEP will produce facility wastes, typical of power generation facility operations and maintenance activities. These will include rags, turbine air filters, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, typical refuse generated by workers and small office operations, and other miscellaneous solid wastes. Additionally, the facility will generate spent trailer-mounted deionization water treatment and zero-liquid discharge (ZLD) waste water units, which will be shipped back to the vendor for regeneration and reuse.

The primary wastewater collection system for general facility drainage will consist of area washdown, sample drains, equipment leakage, and drainage from facility equipment areas. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping, and will be routed to the facility's oil/water separator before recycling the water after ZLD unit treatment. The secondary wastewater collection system will collect sanitary

wastewater from sinks, toilets, showers, and other sanitary facilities, which will be collected within an onsite septic tank that will be pumped out and hauled offsite for treatment.

Wastes that will be generated at the facility during operation are summarized in Table 5.14-2 of the AFC. The catalyst units will contain heavy metals that are considered hazardous. Turbine water wash wastes will be generated from periodic cleaning of the combustion turbine generators (CTGs). These wastes may contain elevated concentrations of heavy metals and will be collected for offsite disposal. After testing, water collected from the chemical storage containment areas will be directed to the oil/water separator for treatment and onsite recycling or shipped offsite for disposal. The quantity of this effluent is expected to be minimal.

Hazardous waste generated at MEP will be stored at that facility for less than 90 days. The hazardous waste will then be transported by a permitted hazardous waste transporter to a treatment, storage, and disposal (TSD) facility. For ultimate disposal, California has the three hazardous waste (Class I) landfills described below. The closest commercial hazardous waste disposal facility is the Waste Management Kettleman Hills Landfill in Kings County.

D. Cumulative Impacts

MEP will generate nonhazardous solid waste that will add to the total waste generated in Alameda County and in California. However, there is adequate recycling and landfill capacity in California to recycle and dispose of the waste generated by MEP. It is estimated that MEP will generate approximately 159 tons of solid waste during construction and about 39 tons a year from operations. Considering that 1,790,756 tons of solid waste were landfilled in Alameda County in the year 2008, MEP's contribution will likely represent a small fraction of the County's total waste generation (CIWMB, 2009b)[1]. Therefore, the impact of the project on solid waste recycling and disposal capacity will not be significant.

Hazardous waste generated will consist of waste oil, filters, SCR and oxidation catalysts, and fluids used to clean piping. The waste oil, catalysts, and both the deionization and ZLD trailer units will be recycled. Hazardous waste treatment and disposal capacity in California is more than adequate. Therefore, MEP's effect on hazardous waste recycling, treatment, and disposal capability will not be significant.

Recycling efforts will be prioritized wherever practical, and capacity is available in a variety of treatment and disposal facilities. Because waste from the MEP site would not result in significant adverse impacts, impacts from MEP would not likely combine with those from additional projects near the MEP site to result in cumulatively considerable impacts.

E. Mitigation

The handling and management of waste generated by MEP will follow the hierarchical approach of source reduction, recycling, treatment, and disposal. The first priority will be to reduce the quantity of waste generated through pollution prevention methods (e.g., high-efficiency cleaning methods). The next level of waste management will involve the reusing or recycling wastes (e.g., used oil recycling). For wastes that cannot be recycled, treatment will be used, if possible, to make the waste non-hazardous (e.g., neutralization).

---

[1] California Integrated Waste Management Board (CIWMB). 2009b. *2008 Landfill Summary Tonnage Report.* http://www.ciwmb.ca.gov/Landfills/Tonnages/. April 1.

Finally, offsite disposal will be used to dispose of residual wastes that cannot be reused, recycled, or treated.

Because the environmental impacts caused by wastes generated during construction and operation of the facility are expected to be insignificant, extensive monitoring programs will not be required. Generated waste, both nonhazardous and hazardous, will be monitored during project construction and operation in accordance with the monitoring and reporting requirements mandated by the regulatory permits to be obtained for construction and operation. Project implementation will occur in compliance with all Laws, Ordinances, Regulations and Standards (LORS) regulating the management of hazardous and non-hazardous wastes during both facility construction and operation.

III. Proposed Licensing Conditions

The Staff Assessment (SA) for the project filed by the CEC recommends that 7 Conditions of Certification be adopted to address waste management issues, specifically hazardous waste management issues, WASTE-1 through WASTE-7. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

IV. Correlation to SA and Hearing Topics

- Waste Management.

Water Resources

I. Introduction

A. Names: Matt Franck

B. Qualifications: Matt Franck's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.15 Water Resources; Volume 2, Appendix 5.15 A Preliminary Stormwater Management Design, dated June 15, 2009 [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.15 Water Resources, dated March 5, 2010. [Exhibit 6].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].
- CH2M HILL'S R. Sarvey Data Response Set 2, dated May 12, 2010. Responses to 43-44 [Exhibit 14].
- BBID Recycled Water Feasibility Study, Draft dated July 2001 [Exhibit 17].
- Byron Bethany Irrigation District (BBID) Recycled Water Policy, dated October 12, 2001 [Exhibit 18].
- Letter from Byron Bethany Irrigation District RE Background Information on the District, dated November 23, 2009 [Exhibit 27].
- Letter Regarding Clarification of Water Supply with BBID, dated October 6, 2010 [Exhibit 55].
- Applicant's Comments on the Staff Assessment, dated November 24, 2010 [Exhibit 61].
- BBID Comments on the Staff Assessment, dated November 28, 2010 [Exhibit 63].
- Project Description Update for Proposed Water Supply and Natural Gas Pipelines, dated December 1, 2010 [Exhibit 64].
- Project Description Update, Water Conservation Program, dated December 9, 2010 [Exhibit 66].

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such

opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The MEP site is located in the San Joaquin Basin, which includes the San Joaquin Valley, the eastern slope of the Coast Ranges, and the western slope of the Sierra Nevada. The principal streams in the basin are the San Joaquin River and its larger tributaries: the Cosumnes, Calaveras, Mokelumne, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno rivers. Major reservoirs include Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones. The MEP site is not located near any of these surface water features.

In addition to the rivers, surface water is imported to the basin through several main canals via the State Water Project (SWP) and the federal Central Valley Project (CVP). These canals include the Delta-Mendota Canal (CVP) and the California Aqueduct (SWP). These sources provide water to agricultural lands as well as cities and industries throughout the San Joaquin Valley region and Southern California. The California Aqueduct and the Delta-Mendota Canal are each located approximately 1 mile away from the MEP site.

MEP will mitigate storm runoff with a series of inlets and storm drain pipes that will convey runoff to a proposed onsite extended detention basin located on the north end of the site. The extended detention basin is designed to release site stormwater runoff from the design storm over a 48-hour period to allow particles and associated pollutants to settle. The multi-stage discharge structure will discharge to one of the swales routing upgradient stormwater around the site.

The MEP site is located in the southern two-thirds of the Central Valley aquifer system which contains most of the fresh water in the valley. The aquifer system in the San Joaquin Valley generally consists of an upper and a lower aquifer, separated by a thick clay layer (the Corcoran Clay member of the Tulare). These clay zones function as impermeable aquitards that restrict vertical and lateral movement of groundwater. The Corcoran Clay is a competent barrier between the upper and the lower aquifers in the southern sections of the San Joaquin Valley; however, it becomes increasingly thin as it extends north toward the proposed MEP site. Where the Corcoran Clay disappears, the lower aquifer is no longer isolated from the upper aquifer. The regional groundwater flow can be affected by numerous lenses of fine-grained materials that are distributed throughout the aquifer, potentially leading to variably-sized perched water tables and areas of decreased permeability.

The Federal Emergency Management Agency has not published flood insurance rate maps for the area where the MEP site is located. As no nearby areas are designated as special flood hazard areas, it is unlikely that the project site is subject to flooding. The MEP site is not in an area subject to flooding from a tsunami or seiche.

MEP will use water supplied by BBID via a new 10-inch-diameter, 1.8-mile water supply pipeline placed in or along the east side of Bruns Road, from existing Canal 45 south to the plant site. Assuming a realistic operating scenario of 600 hours per year and 200 startup and

shutdown events, MEP will use about 34.8 acre-feet per year (26.1 acre-feet per year for 600hours of operation and 8.7 acre-feet per year for 200 starts and stops).

A will-serve letter from BBID indicates that BBID has available water supply to serve MEP in excess of project needs. Given the water conservation measures already incorporated into the project design, lack of a local reliable source of recycled water, the increase in potential environmental impacts associated with constructing additional and longer conveyance pipeline routes, and the relatively small quantity of water that is expected to be used at MEP, the use of recycled water is not economically feasible for this project.

Almost all (99.8 percent) of the water supplied to MEP will be used for various plant processes. The remaining 0.2 percent will be used for domestic purposes such as eye-wash stations, safety showers, drinking water, and sanitary facilities. A combined service water/fire protection 520,000-gallon water storage tank will store raw supply water from BBID. Untreated supply water from BBID will be used for general (nonpotable) needs such as landscaping, chiller fill and make-up, fire protection, and hose bibs (equipment and surface washdown).

B. Construction Impacts

During construction, water will be required primarily for dust suppression, but will also be used for concrete washout, soil compaction, and hydrostatic testing of the pipeline. Because of the short duration of construction activities and the relatively limited water requirements (approximately 2,500 gallons per day) during the construction phase of the project, no significant adverse impacts to the water supply are expected from construction.

During construction, approximately 10 acres of land associated with the plant will be disturbed, plus an additional 9.2 acres for worker parking and laydown areas. Potential impacts from construction will be limited to surface water runoff during excavation and construction. Such construction impacts are minor and can be controlled by implementing a Stormwater Pollution Prevention Plan (SWPPP); Drainage, Erosion, and Sediment Control Plan (DESCP), and associated best management practices (BMPs) in accordance with local agency requirements and the National Pollutant Discharge Elimination System (NPDES) construction permit issued by the State Water Resources Control Board. Site grading and drainage will be designed to comply with all applicable laws, ordinances, regulations and standards (LORS).

Water used for dust control and soil compaction during construction will not result in discharge. During the construction period, sanitary waste will be collected in portable toilets (no discharge) supplied by a licensed contractor for collection and disposal at an appropriate receiving facility. Equipment wash water will be collected and disposed of offsite.

C. Operational Impacts

MEP's water usage is consistent with State Water Resources Control Board (SWRCB) Resolution 75-58 and the CEC's fresh water policy because alternative cooling technology has been incorporated into the project design to avoid the use of fresh water for cooling purposes and the project has been designed to minimize water usage. As part of the proposed project, Mariposa Energy will commit to voluntarily funding a water conservation program designed to conserve a volume of raw water equal to the volume of water consumed by MEP annually for process needs (potable water for personnel consumption, eyewash stations, showers, and sanitary needs not included).

As a result of this commitment to voluntarily fund water conservation, MEP will not result in a net increase in consumption of raw water within BBID.

Because MEP will not result in an increase in raw water consumption, the project will have no possibility of a significant impact on water supply. MEP will have no water supply impact on farmers who rely on BBID as their water supplier. MEP will make no direct use of groundwater resources and will have no effect on groundwater quantity or quality.

MEP has been designed as a zero liquid discharge (ZLD) facility. Process wastewater and stormwater runoff from plant equipment process areas will be treated on-site via an oil/water separator and activated carbon filtration system. The treated water will then be recycled to the raw water storage tank for plant process water usage. Stormwater outside of these areas will be collected and diverted to a retention basin, which will be designed to release water over a 48-hour period. Offsite stormwater will be directed around the site by two grass-lined swales and into the natural drainage using rip-rap energy dissipaters.

Impervious areas onsite will be limited to paved loop and equipment access roads and the equipment to operate the plant. Forty-four percent of the MEP site will have impervious surfaces for equipment siting and roads. The extended detention basin outfall discharge rates will not be greater than pre-development site stormwater discharge rates. Additionally, the extended detention basin will improve the water quality by allowing sediments to settle out prior to discharge. Although road paving will increase site runoff, this measure will improve both the air and water quality by minimizing dust during the dry season and sedimentation of runoff during rain events. The grading and drainage of the proposed plant was designed in accordance with the Alameda County Flood Control and Water Conservation District *C.3 Stormwater Technical Guidance*.

We agree with Staff's conclusion that the proposed MEP would not result in any unmitigable project-specific or cumulative significant adverse impacts to water resources and would comply with all applicable LORS if all of the recommended conditions of certification are adopted by the Commission and implemented.

D. Cumulative Impacts

We agree with Staff that with implementation of the proposed mitigation measures, the SWPPP and the DESCP, the proposed MEP would not result in any cumulative significant adverse impacts to water resources.

E. Mitigation

The proposed mitigation measures are prescribed by stormwater and erosion control management programs mandated under the NPDES permitting system. These programs have been in place for a number of years and the prescribed measures have proven effective. Under the General NPDES Permit for Construction, for example, various specific measures are prescribed, and a program of monitoring is required. The programs are at least 90 percent effective, have been in place for a number of years, as mandated by the Clean Water Act, and have proven effective.

- Implement BMPs designed to minimize soil erosion and sediment transport during construction of the plant site. Design appropriate erosion and sediment controls for slopes, catch basins, culverts, stream channels, and other areas prone to erosion.
- Conduct operations at the plant site in accordance with the EPA's Storm Water Phase I Final Rule (for construction activities disturbing 1 acre or more). Design and implement the BMPs to prevent or control pollutants potentially associated with the operation of the plant from entering stormwater sewers.
- Perform refueling and maintenance of mobile construction equipment only in designated lined and/or bermed areas located away from stream channels. Prepare and implement spill contingency plans in areas where they are appropriate.
- Prepare and implement submit a SWPPP and DESCP to ensure quality of discharged stormwater.

III. Proposed Licensing Conditions

The Staff Assessment Supplement (SSA) for the project filed by the CEC recommends that five Conditions of Certification (COCs) be adopted to address water (and soil) resources issues, SOIL&WATER-1 through SOIL&WATER-5. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Soil and Water Resources

This page intentionally blank

Worker Health and Safety

I. Introduction

A. Name: Doug Urry

B. Qualifications: Mr. Urry's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 5.16 Worker Health & Safety [Exhibit 1].
- Applicant's Supplement B Additional Laydown Area Analysis, Section 3.16 Worker Safety and Fire Protection, dated March 5, 2010 [Exhibit 6].
- Rajesh Dighe Data Responses, Set 1, dated March 8, 2010. Response to Data Request 4 [Exhibit 10].
- Applicant's Data Response Set 1D, dated March 31, 2010. Response to CEC Staff & Data Request 56 [Exhibit 11].
- CH2M HILL's R. Sarvey Data Response Set 2, dated May 12, 2010. Responses to 32 through 37 [Exhibit 14].

To the best of my knowledge, all of the facts contained in this Section of the Applicant's testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own based upon my professional judgment. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

During this project, the workers will be exposed to construction safety and operation hazards. A hazard analysis has been prepared to evaluate the project hazards and control measures. The analysis identifies the hazards anticipated during construction and operation and indicates which safety programs should be developed and implemented to mitigate and appropriately manage those hazards. MEP construction and operation will be conducted in accordance with all applicable federal, state and local (Alameda County) Laws, Ordinances, Regulations and Standards (LORS) relating to worker health and safety.

Overview of Hazards and Related Programs and Training

Programs are overall plans that set forth the method or methods that will be followed to achieve particular health and safety objectives. For example, the Fire Protection and Prevention

Program will describe appropriate procedures and plans to protect against and prevent fires, including equipment required, such as alarm systems and firefighting equipment, and procedures to protect against fires. The Emergency Action Program/Plan will describe escape procedures, rescue and medical procedures, alarm and communication systems, and response procedures for very hazardous materials that can migrate. The programs or plans are contained in written documents that are usually kept at specific locations within the facility. Each program or plan will contain training requirements that are translated into detailed training courses.

Health and Safety Programs

To protect the safety and health of workers during the construction and operation of MEP, health and safety programs designed to mitigate hazards and comply with applicable regulations will be implemented. Periodic audits will be performed by qualified individuals to determine whether proper work practices are being used to mitigate hazardous conditions and to evaluate regulatory compliance.

Operations Health and Safety Program

Upon completion of construction and commencement of operations at MEP, the construction safety and health program will transition into an operations-oriented program reflecting the hazards and controls necessary during operation.

Safety Training Programs

To ensure that employees recognize and understand how to protect themselves from potential hazards at MEP, comprehensive training programs for construction and operation will be implemented. Each of the safety procedures developed to control and mitigate potential site hazards will require some form of training. Training will be delivered in various ways, depending on the requirements of Cal-OSHA standards, the complexity of the topic, the characteristics of the workforce, and the degree of risk associated with each of the identified hazards.

Emergency Response

MEP is in the jurisdiction of the Alameda County Fire Department (ACFD). ACFD Station 8 is located approximately 19 miles from MEP. Station 8 in Livermore is the primary responding station for the MEP vicinity, with an approximate response time to an emergency at the project site of 30 minutes. ACFD Station 20 is approximately 16 miles from MEP, with an approximate response time to an emergency at the project site of 25 minutes. Although Station 8 is identified as the primary responding station, either may be called upon to respond.

ACFD response time delays would most likely occur during recurring peak periods on I-580, where most of the congestion occurs in this area. From Stations 8 and 20, traffic conditions on eastbound I-580 typically result in 3 minutes delay during the AM peak period and 5 minutes delay during the PM peak period. Delays could increase in the case of significant accidents or other irregular incidents on the freeway.

MEP is also near Tracy Fire Department (TFD) stations, and as such may be served by those stations under a mutual aid agreement between the two jurisdictions. TFD would support emergency response activities in eastern Alameda County if requested by ACFD, and if

resources were available. The nearest TFD station is Station 98, approximately 4.2 miles via road from the MEP site, with an approximate response time of approximately 12 minutes.

Based on the Applicant's experience owning and operating power plants and the results of CEC Staff analysis on this subject, the Applicant does not expect a significant increase in demands on either Alameda County or Tracy Fire Departments due to the approval of MEP.

III. Proposed Licensing Conditions

The Supplemental Staff Assessment (SSA) for the project filed by the CEC recommends that five Conditions of Certification be adopted to address worker safety and fire protection issues: WORKER SAFETY-1 through WORKER SAFETY-5. The Applicant has reviewed the Staff's proposed COCs and finds them acceptable.

IV. Correlation to SSA and Hearing Topics

- Worker Safety and Fire Protection

This page intentionally blank

Alternatives

I. Introduction

A. Name: Doug Urry and Gary Normoyle

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1, Section 6 Alternatives, dated June 15, 2009 [Exhibit 1].
- Data Response Set 1A & 1B, dated November 30, 2009. Responses to CEC Staff Data Requests 15 through 17 [Exhibit 7].
- Rajesh Dighe Data Responses, Set 1, dated March 8, 2010. Responses to Data Requests 1 through 3 [Exhibit 10].
- Robert Sarvey Data Responses Set 2, dated May 12, 2010. Response to 39 through 42 [Exhibit 14].

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A range of reasonable alternatives were identified and evaluated in the AFC Alternatives section including the "no project" alternative (that is, not developing a new power generation facility), alternative site locations for constructing and operating MEP, alternative project design features (including linear routes and water supply source), and various technology alternatives.

These alternatives were then compared to the basic project objectives. The main objective of MEP is to provide dispatchable, operationally flexible, and efficient generation to meet Pacific Gas and Electric Company's (PG&E) need for new energy sources in the San Francisco Load Pocket, which includes Alameda County and the San Francisco Bay Area, to support and back up intermittent renewable resources (e.g., wind and solar), and to satisfy the terms of MEP's power purchase agreement with PG&E. Some of the basic project objectives include the following:

- Safely construct and operate a 200-MW, natural gas-fired, simple-cycle generating facility to meet PG&E's growing peak load and the growing energy demands of customers within the San Francisco Load Pocket in PG&E's service territory.

- Site the project within the Altamont Wind Resource Area in order to supply back-up generation when the local wind turbines decrease output due to decreased wind. The quick start, peaking facility will be utilized to supplement the renewable wind generation during periods of low or variable wind resource in order to maintain grid stability.
- Site the project as near as possible to a PG&E substation with available transmission capacity.
- Site the project to minimize or eliminate the length of any project linears, including gas and water supply pipelines, as well as transmission interconnections. These objectives minimize potential offsite environmental impacts and the cost of construction.
- Assist Alameda County in meeting its electrical energy needs by providing additional local dispatchable generation, decreasing the amount of imported energy and providing system/grid support at critical times, such as periods of decreasing renewable generation and peak load conditions.
- Minimize environmental and air quality impacts.
- Assist the State of California in developing increased local generation projects, thus reducing dependence on imported power.

Alternative Site Locations

Several alternative site locations were assessed during initial screening for MEP. This initial screening identified the MEP site and two alternatives: Alternative Site #1 (Costanza Site), and Alternative Site #2 (Gomes Site).

The key screening criteria used to select the MEP site and alternative sites included:

- Location within PG&E's service territory
- Ability to gain site control
- Availability of sufficient land area
- Proximity to existing transmission and distribution lines and to an existing substation with transmission capacity
- Location near a source of water supply of sufficient quantity and quality
- Consistency and compatibility with the Alameda County East County Area Plan (ECAP), zoning ordinances, and existing land uses
- Location avoiding established airport take-off and approach patterns
- The ability to avoid or minimize potentially significant impacts on the environment.

Although each of the alternative sites could feasibly attain most of the project's basic objectives, the MEP site clearly became the preferred alternative for a variety of reasons, including minimizing the required construction of transmission, gas supply, and water supply linear features, and minimizing the project's environmental impacts. Taken all together, the MEP site best meets the project objectives without resulting in any adverse environmental impacts as

compared to the Costanza and Gomes sites. As a result, the Costanza and Gomes sites were rejected in favor of the MEP site.

No Project Alternative

If the project were not constructed, Mariposa Energy's basic project objectives would not be met. A new natural gas-fired generating facility would not be constructed within the PG&E service territory. Instead, to meet PG&E's growing load, PG&E would need to obtain additional generation from other sources, which are potentially older and less efficient and release larger quantities of air pollutants than MEP. Moreover, grid stability would be compromised because a highly dispatchable and flexible peaking project would not be sited near the Altamont Wind Resource Area to provide system stability and reliability during periods of low wind.

The no project alternative could result in greater fuel consumption, air pollution, and other environmental impacts in the state because older, less efficient plants with higher air emissions would continue to generate power instead of being replaced with cleaner, more efficient plants, such as MEP. Also, the no project alternative would fail to meet the objective of assisting the State of California in reducing dependence on unreliable imported power. During limited availability of in-state generated electricity, such imported electrical energy has proven to be expensive and inconsistently available. Moreover, the no project alternative would not satisfactorily meet the project objectives specified above and thus was rejected in favor of the proposed project.

Alternate Project Design Features

Because of the short distance, direct route, and the lack of potentially significant impacts associated with the natural gas supply pipeline and transmission line route interconnection, no other alternatives would avoid or minimize potentially significant effects compared to the chosen routes. The facility will connect via a new water supply line from BBID Canal 45. Due to the existence of a direct route along existing roadway corridor and the lack of potentially significant impacts associated with this interconnection, no other alternatives would avoid or minimize potentially significant effects compared to the chosen route.

A local reliable source of recycled water is not available, as the Mountain House Community Services District (MHCSD), the nearest potential source of recycled water, does not currently discharge quantities sufficient to meet planned recycled water demand in the community. Additionally, the potential environmental impacts associated with construction of the approximately 5.5-mile recycled water supply pipeline from the Mountain House Waste Water Treatment Plant (WWTP) would be much greater than with the proposed 1.8-mile BBID water supply pipeline. Finally, even if the use of recycled water from Mountain House were feasible, the 1.8 mile water pipeline from BBID to the project site would need to be constructed to ensure water supply reliability and to provide potable water to MEP. Based on the limited water usage quantities of no more than 187 acre-feet per year required for MEP, the use of recycled water is not economically feasible for this project.

Technology Alternatives

Alternate turbines technologies such as the Conventional Boiler and Steam Turbine, the Combined-cycle Combustion Turbine, the Kalina Combined-Cycle, and internal combustion engines were reviewed. Ultimately, the GE LM6000 PC Sprint combustion turbine technology

was selected primarily because it is proven, reliable equipment that also provides operational flexibility, high reliability/availability, and low equivalent forced outage rate. Further, the Applicant's parent company, Diamond Generating Corporation, owns and operates five LM 6000 Sprint units in peaking service in California.

Technologies based on fuels other than natural gas were eliminated from consideration because they do not meet the project objective of providing operationally flexible, dispatchable, quick start, and reliable power. Some of these alternative fuels have potential for additional air quality and public health impacts. Others, like certain biofuels, are not available in commercial quantities or are not available via pipeline or other reliable delivery system. The availability of the natural gas resource provided by PG&E, as well as the environmental and operational advantages of natural gas technologies, makes natural gas the logical choice for the proposed project.

Available alternatives for inlet air cooling include water-based systems and mechanical chillers. Water-based systems will result in the consumption of a valuable California resource (water), while the mechanical chiller system will not. Water cooling uses less parasitic load and therefore would slightly increase the cycle efficiency. Mechanical chillers provide lower inlet temperatures and therefore provide greater power output at a slightly higher heat rate (i.e., slightly lower efficiency) at higher ambient temperatures when peaking power is needed, given the large air conditioning loads in the region. Despite the slight decrease in plant output, the mechanical chiller system was selected based on its having a lower environmental impact over the water-based cooling systems due to its avoidance of the use of water.

The Applicant has elected to use R134A as the chiller refrigerant working fluid, despite an increased capital cost of approximately $2.5 million and decreased plant generation output of approximately 1.75 MW. While this refrigerant has a reduced operating efficiency and increased costs compared with anhydrous ammonia, it was selected to minimize the transportation, storage, and use of hazardous materials in association with the project.

III. Proposed Licensing Conditions

There are no Conditions of Certification related to Alternatives.

IV. Correlation to SSA and Hearing Topics

- Alternatives

Appendix A
Resumes

APPENDIX A

Resumes

Mark Bastasch, P.E., I.N.C.E.

Noise Task Lead

Education

M.S., Environmental Engineering
B.S. (cum laude), Environmental Engineering

Professional Registrations

Registered Acoustical Engineer: Oregon (No. 58990PE)
Professional Environmental Engineer: Oregon (No. 58990PE)
Professional Civil Engineer: Oregon, 1999 (No. 58990PE)
Certified Water Rights Examiner: Oregon, 2000 (No. 58990WRE)

Distinguishing Qualifications

- Has prepared acoustical analysis or expert testimony for more than 15,000 megawatts (MW) from gas-fired facilities (primarily in California) and more than 5,000 MW from wind generation facilities nationwide
- Specializes in industrial noise measurements, modeling and control for power, industrial, and transportation clients
- Has prepared detailed noise models of numerous power facilities
- Has prepared comprehensive and cost effective compliance reports for several gas-fired power facilities demonstrating that permit conditions were satisfied

Relevant Experience

Mr. Bastasch is a registered acoustical, environmental, and civil engineer with more than 10 years experience conducting acoustical studies. Mr. Bastasch's acoustical experience includes preliminary siting studies, regulatory development and assessments, ambient noise measurements, industrial measurements for model development and compliance purposes, mitigation analysis, and modeling of industrial and transportation noise.

Representative Projects

Mariposa Energy Project (MEP) Application for Certification (AFC); Mariposa Energy, LLC; Alameda County, California. Authored the Noise section for the MEP AFC. The project consisted of a natural gas-fired, simple-cycle electrical generating facility rated at a nominal generating capacity of 200 megawatts.

Almond 2 Power Plant (A2PP) AFC; Turlock Irrigation District; Ceres, California. Authored the Noise section for the A2PP AFC. The project consisted of a natural gas-fired, simple-cycle peaking facility rated at a gross generating capacity of 174 megawatts.

BrightSource Energy, Ivanpah Solar Electric Generating System. Authored noise section of California Energy Commission Application for Certification. Successfully worked with CEC staff to streamline noise analysis and eliminate unnecessary field studies given remote project site and lack of noise sensitive receptors.

Licensing and Permitting for Cosumnes Power Plant, Sacramento Municipal Utility District, California. Acoustical technical lead for this two-phase, 1,000-MW combined-cycle power plant on buffer lands for the former Rancho Seco Nuclear Plant. Prepared AFC, worked with SMUD legal council and permitting team to address intervener comments. Alternative mitigation measures were developed in consultation with CEC Staff to establish acceptable Conditions of Certification.

Licensing and Permitting for San Francisco Electric Reliability Project (SFERP) for San Francisco Public Utilities Commission. Noise task lead for this power plant. The SFPUC proposed to develop a 145-MW simple-cycle plant in southeast San Francisco, using three LM 6000 turbines. Although construction of another power plant in southeast San Francisco was controversial, it was licensed by the CEC. The plant would be located two blocks south of the existing Portrero Power Plant. Major issued included remediation of the power plant site (contaminated fill); Air Quality mitigation measures; water supply; Environmental Justice; and the need for in-city generation.

Walnut Energy Center, Turlock Irrigation District, Turlock, California. Acoustical technical lead for a combined cycle power plant. Tasks included evaluating and measuring background noise levels; development of detailed noise model, comparison of expected noise levels with the City of Turlock, County of Stanislaus, and the California Energy Commission's (CEC) noise guidelines; preparing Application for Certification and subsequent amendments submitted to the CEC; regulatory negotiation; and review of Conditions of Certification. Additional tasks included development assistance with acoustical bid and guarantee specifications and independent analysis of manufacturer steam turbine generator enclosure.

Calpine GE LM6000 Peaker Program, Calpine Corporation, Dublin, California. Project manager and acoustical lead for Calpine's Peaker Program. Prepared California Environmental Quality Act level noise assessments for more than 10 LM6000-based peaking power plants located throughout northern California. Developed a flexible and streamlined program to accurately and quickly prepare acoustical assessment. Tasks included regulatory review and interpretation of city and county noise standards, ambient measurements and analysis, development of a standardized model that included several levels of optional mitigation and field verification at operating facilities, and regulatory negotiating.

Edison Mission Energy's GE LMS100 Peaking Facilities, Southern California. Acoustical technical lead for two simple cycle power facilities each utilizing 5 GE LMS100 combustion turbines in simple cycle. Tasks included evaluating and measuring background noise levels to determine and evaluate risk associated with potential CEC permit limits; extensive coordination with GE given limited available data resulting from short operating history of the LMS100 (these were the first LMS100 evaluated in California); preparing Application for Certification to the CEC. Additional tasks included development and review of acoustical bid and guarantee specifications for cooling towers, SCR, stack, transformers, and other balance of plant equipment.

David H. Blackwell

Partner
Walnut Creek Office

Phone: 925.943.5551
Facsimile: 925.943.5553
dblackwell@allenmatkins.com

Focus
Land Use, Environmental, and Natural Resources
Litigation
Real Estate

Education
LL.M., with Merit, International Law, The London School of Economics and Political Science

J.D., University of Utah College of Law

B.A, with Honors, University of California at Santa Barbara

David is a partner in our Walnut Creek office where he practices real estate law with an emphasis on land use entitlements and litigation. His experience includes representing landowners, developers, businesses and governmental entities before administrative agencies and state and federal courts. David is a co-author of *Ballot Box Navigator: A Practical and Tactical Guide to Land Use Initiatives and Referenda in California* (Solano Press Books, 2003). He served as Vice-Chair of the Executive Committee for the State Bar's Real Property Law Section and is a member of the State Bar of California (Litigation and Real Property Sections), and the Contra Costa County Bar Association. David holds an A-V rating, and has been named a Northern California *Super Lawyer*.

David secures entitlements for commercial, industrial, and residential projects throughout California involving all areas of land use law, including state and local planning and zoning law, the California Environmental Quality Act, the Subdivision Map Act, initiatives and referenda, annexations, condominium conversions, affordable housing, sustainable energy, wetlands regulations, eminent domain and inverse condemnation, the Williamson Act and development agreements. He advises purchasers, developers, investors and lenders regarding existing entitlements on real property, identifying potential land use issues and developing a strategy for obtaining entitlements if existing entitlements are insufficient. David also litigates these issues in state and federal courts, both at the trial court and appellate court levels.

David is admitted to appear before the U.S. Supreme Court, the Federal and Ninth Circuits of the U.S. Court of Appeals, the U.S. Court of Federal Claims and the U.S. District Court for the Northern, Central and Eastern Districts of California.

RECENT MATTERS:

Entitlements/Transactional

- **Mesa Development, LLC (San Jose)** Represented Chicago-based developer with securing entitlements for large mixed-use project in downtown San Jose.

- **Diamond Generating (Alameda County)** Assisting subsidiary of Mitsubishi with securing CEC approvals for electrical power plant, including

negotiations with the County and the Department of Conservation regarding Williamson Act issues.

- **ProLogis/Pacific Region (Fremont)** Assisting developer with securing key entitlements for development of mixed use area of Pacific Commons development.

- **The Home Depot (Various Northern California locations)** Performed due diligence review and oversight for siting of several new stores in the Bay Area.

- **Wrightwood Capital, LLC (Napa)** Performed due diligence for Chicago-based mezzanine lender regarding potential purchase of industrial property in southern Napa County.

- **Matteson Realty Services (San Carlos)** Represented client in successful negotiations with the City regarding scope of affordable housing unit project.

- **Insurance Auto Auctions, Inc. (Rancho Cordova)** Performing due diligence for auto auction uses on two separate sites in Rancho Cordova.

- **CoreSite (Santa Clara)** Assisting client with securing entitlements for proposed data centers.

- **Clift Holdings (San Francisco)** Assisting client with hotel unit conversion under City's conversion ordinance.

- **LBA Realty (South San Francisco)** Represented developer in securing a Use Intensity Agreement with City.

- **AEW Value Industries, L.P. (San Ramon)** Assisted capital partner with securing conditional use authorization and parking agreement for medical office use.

- **Albion Castle, LLC (San Francisco)** Successfully secured conditional use authorization from City and County of San Francisco for re-establishment of historical brewery.

- **IKEA Property, Inc. (East Palo Alto/Dublin)** Assisted retail client with drafting and securing City approval of successful ballot measure regarding the development of a store in East Palo Alto. Also assisted this client with securing entitlements for a new store in Dublin.

- **JMA Ventures, LLC (Placer County)** Initiated administrative challenges to County's approvals of adjoining property's development project in Lake Tahoe.

- **Blackstone (Various)** Performed due diligence with regard to numerous northern California properties.

- **AG West (San Francisco)** Provided due diligence with regard to acquisition of undeveloped property for large residential project.

- **D.R. Horton, Inc./Western Pacific Housing (Various Northern California locations)** Assisted major homebuilder with variety of issues, including reimbursement agreement in cities of Richmond and Oakley, respectively, on behalf of residential developer.

- **WestCo Community Builders (Tracy)** Represented developer in negotiations with City regarding dedication and construction agreements.

- **Anka Developments, Inc. (San Francisco)** Performed due diligence review purchaser and conducted negotiations with seller for large residential project in downtown San Francisco.

- **HSBC Bank Credit Corporation (Various Northern California locations)** Performed due diligence analyses for lender on several major development projects.

- **Meritage Homes of Northern California (Various locations)** Represented residential developer in a variety of jurisdictions involving Subdivision Map Act, planning and zoning, affordable housing and eminent domain issues.

- **EAH, Inc. (Corte Madera)** Secured entitlements for affordable housing project in Marin County, and resolved easement and access issues relating to adjoining landowners.

- **Hudson McDonald, LLC (Berkeley)** Assisted developer with securing approvals for large mixed-use affordable housing project in downtown Berkeley.

- **Pardee Homes (Livermore)** Assisted developer of highly controversial development project in securing legislative entitlements by preparing and qualifying initiative.

- **Lowe Enterprises (Lake Tahoe)** Performed due diligence for complicated purchase of interest in Squaw Creek Resort.

- **SNK Incentive (Various Northern California locations)** Assisted developer with due diligence review and negotiations with sellers and local agencies regarding entitlements for two large Northern California residential projects.

- **Despa Deutsche Sparkassen-Immobilien-Anlage-Gesellshaft mbH (San Francisco)** Represented German investment fund in securing conditional use authorization for its One Union Square property in San Francisco.

- **Pacific Union Homes (Lathrop and Santa Cruz County)** Assisted consortium of developers with negotiations with City of Lathrop for securing wastewater spray fields. Prepared development agreements for developer's mixed-use projects in Santa Cruz.

- **In-N-Out (San Luis Obispo County)** Counseled owner of large ranch with regard to conveyance of antiquated lots.

- **Kennedy Wilson Multifamily (San Francisco)** Performed due diligence on behalf of potential purchaser of portions of the Fox Plaza development in San Francisco.

- **H.J. Shein, Inc./Green Valley Land, LLC (Fairfield)** Assisted developer with transactional and environmental issues regarding purchase and sale of proposed commercial site in Fairfield.

- **Kimpton Hotel & Restaurant Group (San Francisco)** Assisted hotel owner and operator with securing lease extension for San Francisco property.

- **Clark Realty, LLC (Fort Ord)** Assisted joint venture between developer and federal government regarding land use jurisdictional issues over military installation.

- **Wharton School of Business (San Francisco)** Represented institution regarding application of local zoning and building ordinances to project in downtown San Francisco.

Litigation

- **Lake Luciana, LLC (Napa County)** Representing developer in litigation regarding denial of conditional use permit. Also helped secure lot line adjustment approval from County.

- **Taubman Company LLC (Walnut Creek)** Prepared and argued successful writ petition against City regarding City's handling of competing ballot measures for controversial retail project downtown.

- **California Land Surveyors Association (Napa County)** Submited *amicus curiae* brief on behalf of County regarding legality of lot line adjustment ordinance under Subdivision Map Act.

- **Citizens Protecting the Rights of Property Owners, Inc. (Big Bear Lake)** Defeated qualified anti-lodging initiative through successful petition for writ of mandate alleging a procedural defect.

- **Buck Mountain Ranch (Humboldt County)** At trial, successfully represented owner of 13,400-acre ranch in Humboldt County in lawsuit brought by the county alleging Subdivision Map Act and Williamson Act violations regarding sales of lots.

- **Carl Berg/Mission West Properties/West Coast Venture Capital, LLC (San Jose, Fremont)** Representing developer regarding several development projects in San Jose and Fremont. Initiated federal litigation against U.S. Army Corps of Engineers regarding its asserted jurisdiction over wetlands on Fremont property. Also represented owner in eminent domain and inverse condemnation litigation against City of Fremont. Represented Mr. Berg regarding several development projects in San Jose, including multi-lawsuit litigation against the city regarding excessive development fees and conditions.

- **Homestead Community Builders/Woodview Estates, LLC (Novato)** Successfully represented developer in separate mandate proceedings filed by neighborhood group challenging city approvals of residential development project, and drafted the successful appellate briefs. Also represented developer in negotiations with city regarding subdivision map approvals.

- **CarrAmerica (Various)** Represented landowner in litigation with adjoining owner and City of San Jose involving impairment of access rights. Also secured entitlements for expansion of campus industrial property in Alameda County.

- **Alameda Multifamily Ventures, LLC (Alameda)** Successfully represented owner and developer of high-profile apartment complex with securing entitlements for major renovation of property. Also negotiated substantial reduction in building permit fees.

- **City of Chico (Chico)** Successfully defended City in lawsuit brought by property owner. Argued demurrer in trial court regarding application of appropriate statute of limitations under the Subdivision Map Act and Mitigation Fee Act, which property owner unsuccessfully appealed in published opinion.

- **Marin Sanitary Service (San Anselmo)** Successfully represented sanitation company in writ of mandate proceedings brought by competitor involving franchise agreement, referendum and related elections law issues.

- **Surland Companies (Tracy)** Represented developer in litigation challenging approval of large mixed-use project in Tracy. Previously helped counsel developer regarding initiative process and drafted initiative that qualified for November 2004 election. Also previously assisted developer with opposition to siting of power plant next to proposed residential development project and due diligence review relating to development

project; extensive argument before regulatory agency, including examination of witnesses.

- **DIDM Development Corporation (Malibu)** Represented developer in litigation with City of Malibu and California Coastal Commission regarding proposed residential project.

- **Tracy Allocation Group (Tracy)** Represented a consortium of over 25 developers regarding several issues, including the impact of a local growth-control initiative upon their vesting tentative maps; existing and projected wastewater and water capacity; and the City's priority system for new development. Initiated four lawsuits against the City relating to these issues, resulting in favorable settlement agreement that guaranteed capacity to clients over several years.

- **Panoramic Interests (Berkeley)** Represented developer in two lawsuits brought by growth opponents involving CEQA, Planning and Zoning Law, and Historic Preservation issues.

- **Award Homes (Hollister)** Represented residential developer in lawsuit filed against Local Agency Formation Commission regarding proposed annexation of property by City of Hollister. Case settled on favorable terms.

- **Roddy Ranch, LLC (Contra Costa County)** Represented developer and landowner in two lawsuits: (1) Petition for Writ of Mandate challenging Contra Costa County's recent amendment to its Urban Limit Line regulations; (2) Petition for Writ of Mandate challenging LAFCO policy.

- **Innkeeper Associates, Inc./Rim Corporation (Santa Rosa)** Represented hotel developer in several litigation and corporate matters, including breach of contract litigation against independent contractor.

PUBLICATIONS AUTHORED AND PUBLIC SERVICE:

- ***Ballot Box Navigator: A Practical and Tactical Guide to Land Use Initiatives and Referenda in California (Second Edition),*** **Co-author** (Solano Press Books, 2003).

- ***The Williamson Act: Siting Implications For California Projects*** (Solar Industry, 2010)

- ***The Mitigation Fee Act – Controversy, Confusion, and Resulting Caution,*** **Co-author** (California Real Property Journal, Fall 2007).

- ***A Modern Perspective on the Williamson Act: Conservation, Confusion, and Controversy,*** **Co-author** (California Real Property Journal, Fall 2004).

- ***Timing is Everything! When to Bring Challenges to Land Use Initiatives and Referenda,*** **Co-author** (California Real Property Journal, Winter/Spring 2002).

- ***Understanding the Different and Often Dichotomous Roles of a City and the Options Available to It When Dealing with "Growth-Related" Ballot Measures,*** **Co-author** (California Real Property Journal, Fall 2000).

- ***CFA Coalition v. Superior Court: An Overextension of the Deliberative Process Privilege,*** **Author** (San Francisco Attorney, February/March, 1999).

- ***Mission High School Law Academy,*** **Mentor** (1999).

EDUCATION:

- **The London School of Economics and Political Science**
  Master of Laws, International Law, *with Merit*, 1991

- **University of Utah College of Law**
  Juris Doctor, 1990

- **University of California at Santa Barbara**
  Bachelor of Arts, English, *with Honors*, 1986

ASSOCIATIONS:

- U.S. Supreme Court; Federal and Ninth Circuits of the U.S. Court of Appeals; U.S. Court of Federal Claims; U.S. District Court for the Northern, Central, and Eastern Districts of California; State of California.

- State Bar of California Real Property Law Section: former Vice-Chair, Executive Committee.

- Contra Costa County Bar Association.

- Northern California Super Lawyer, 2005 and 2010. AV-Peer Review Rating.

FORMER EMPLOYMENT:

- **Ellman, Burke, Hoffman & Johnson**
  San Francisco (October 1994 – November 1999)
  Represented developers, governmental entities, businesses, and individuals in real property litigation. Second chair counsel representing prominent law firm in commercial landlord-tenant jury trial. Second chair counsel representing city in inverse condemnation court trial.

- **Rivkin, Radler & Kremer**
  Santa Rosa (January 1994 – October 1994)
  Drafted pleadings and memoranda in environmental coverage, product liability, and commercial litigation for New York-based litigation firm.

- **St. John & Cravett**
  San Francisco (March 1992 – June 1993)
  Solo defense counsel in $2.5 million jury trial and $1.3 million court trial. Deposed over fifty expert and percipient witnesses. Extensive participation in hearings, settlement conference, and client meetings.

Loren Bloomberg, P.E.

Traffic and Transportation

Education

M.S., Civil Engineering
B.S., Systems Engineering

Professional Registrations

Professional Engineer (Traffic): California

Relevant Experience

Mr. Bloomberg has led or played a key role in numerous large-scale planning and operations analyses. He has conducted studies and developed plans for local areas, corridors, and entire regions. Mr. Bloomberg's technical expertise is in simulation modeling and traffic operations, with a particular focus on conceptual engineering and traffic analysis. He is often called upon as a technical expert for CH2M HILL's modeling projects, and is known for his ability to complete traffic analyses accurately and efficiently, while meeting client requirements. Mr. Bloomberg is a member of the Highway Capacity Committee of the Transportation Research Board, the international group of 30 professionals charged with developing and maintaining the *Highway Capacity Manual*.

Representative Projects

Task Lead; Ivanpah Solar Electric Generating System; BrightSource Energy; San Bernardino County, California; 2007 to Present. Traffic and transportation task lead for analysis of a solar energy project in the Mojave Desert, near the California/Nevada border. Prepared the traffic and transportation analysis section of the Application for Certification. The analysis focused on construction impacts to traffic operations, including construction workers, truck trips, and transport of hazardous materials. Assessed freeway, ramp, and local streets impacts.

Task Lead; GWF Energy Tracy Combined Cycle Conversion Project; San Joaquin County; California; 2008 to Present. Traffic and transportation task lead for analysis of the conversion of an existing peaking plant to a combined-cycle baseload facility. Prepared the traffic and transportation analysis section of the Application for Certification. The analysis focused on construction impacts to traffic operations, including construction workers, truck trips, and transport of hazardous materials and assessed freeway, ramp, and local streets impacts.

Mariposa Energy Project (MEP) Application for Certification (AFC); Mariposa Energy, LLP; Alameda County, California. Directed the development of the Traffic and Transportation section for the MEP AFC. The project consisted of a natural gas-fired, simple-cycle electrical generating facility rated at a nominal generating capacity of 200 megawatts.

Almond 2 Power Plant (A2PP) AFC; Turlock Irrigation District; Ceres, California. Directed the development of the Traffic and Transportation section for the A2PP AFC. The project consisted of a natural gas-fired, simple-cycle peaking facility rated at a gross generating capacity of 174 megawatts.

Traffic Lead; Ras Tanura Integrated Project (RTIP) Environmental Impact Assessment; Kingdom Of Saudi Arabia; 2009 to Present. Traffic lead and technical advisor on this effort to develop the environment document for improvements to an integrated refinery and petrochemicals complex in Saudi Arabia. Designed the data collection approach, and helped to coordinate outside contractors in multiple countries. Reviewed and analyzed data, and developed traffic impact analysis criteria and methodologies for application in the environmental document. Authored the traffic study.

Task Lead; Eastshore Energy Center; Hayward, California; 2006 to 2007. Traffic lead for the application for certification (AFC) for a new 115.5-megawatt (MW) intermediate/peaking load facility. Led the assessment of the traffic and transportation impacts associated with the construction and operation of the facility. Assessed traffic operations impacts, transport of hazardous materials and public safety. Developed strategic approached for the Transportation Management Plan, and represented the applicant (for transportation issues) at California Energy Commission meetings

Walnut Energy Center Traffic Control and Implementation Plan (TCIP), Turlock Irrigation District (2004 to 2005). Developed the traffic control plan for the utility (potable and recycled water) lines for the Walnut Energy Center in Turlock. The TCIP addressed the mitigation of traffic impacts to the existing transportation facilities to satisfy the requirements of the CEC Conditions of Certification.

Metcalf Energy Center, Calpine Corp., San Jose (2001 to 2002). Task lead for traffic control for this fast-track effort to design and construct linear facilities (recycled water, sewer, and potable water) to support a new energy center. Developed plans to support two pipeline alignments through 6 to 10 miles of urban streets. Worked with local agencies to develop a transportation management plan to support agency requirements and maintain construction schedules.

San Francisco Electric Reliability Project, San Francisco Public Utilities Commission (2004 to 2005). Task lead for the traffic and transportation section of the AFC. Traffic impacts focused on construction activities.

Proponent's Environmental Assessment (PEA), San Mateo County (2002 to 2004). Task lead for the transportation analysis to support the PEA and associated EIR for a major utility company. The project will involve trenching and overhead construction throughout San Mateo County, with potential impacts to freeways, ramps, surface streets, and BART. Led the transportation analysis (including evaluation, assessment of impacts, and development of mitigation measures) and was primary author for the transportation section of the environmental document. Leading the development of transportation management plans for the multiple jurisdictions.

Infrastructure Improvement Projects and Dutton Meadows EIR, Santa Rosa (2004). Traffic task lead for developing project- and program-level EIRs to support planned development in Santa Rosa. Developed traffic/transportation sections of the CEQA documents, tiering off previous environmental documents and technical studies.

Owens Lake Dust Control Project EIR, Southern California (2001). Traffic task lead for the assessment of the impacts of a major hauling operation near Lone Pine. Gathered traffic information

and forecasts, and conducted reconnaissance with local agency staff. Assessed traffic operations and impacts of the proposed project.

SR 237 Guadalupe Bridge Replacement, Santa Clara County (2003). Traffic task lead for this project to replace the bridge on SR 237 over the Guadalupe River. Developed transportation management plan, including detour plans and lane closure charts. Conducted operational analysis for staging plans and late lane re-opening penalties.

Route 70/Algodon Road Interchange, Yuba City (2002). Task lead for traffic operations analysis to support planning efforts for the Route 70/Algodon Road interchange near Yuba City. Led the analysis is to assess future operations of the freeway, interchange, and cross-streets to identify design improvements.

Highway 114/Hyampom Road, Trinity County (2002 to 2005). Traffic task lead for evaluating a rural road in Trinity County. Mr. Bloomberg directed the effort to gather traffic information and forecasts, conduct reconnaissance with local agency staff, and evaluate existing and future traffic. He worked with client staff to achieve consensus on future forecasts, and helped craft the purpose and need statement.

Clinton-Keith Initial Study/Environmental Assessment, Southern California (2002 to 2005). Traffic task lead for preliminary engineering and environmental documentation for a new transportation corridor in Riverside County. Led the development of traffic forecasts, including integrating travel demand forecasts from the regional model and traffic impact studies. Conducted traffic analysis, and worked with the engineering team to optimize the design. Coordinated traffic inputs to the environmental team.

Harbor Boulevard Improvements Project, Southern California (2004 to 2005). Traffic task lead for preliminary engineering and environmental documentation for improvements to a congested major arterial in Costa Mesa. Coordinated data gathering from Caltrans and Costa Mesa, and conducted detailed operations analysis for multiple alternatives. Prepared traffic analysis documentation and coordinated traffic inputs to the design and environmental teams.

Maly-Ann Bory

Traffic and Transportation

Education

MS Transportation Engineering, University of California at Berkeley, CA

MS Civil Engineering, France

BS Civil Engineering, France

Professional Registrations/ Certifications

Professional Engineer: CA

Distinguishing Qualifications

Expertise in transportation design and traffic and transportation analysis. Experience in traffic and transportation analyses for energy project Applications for Certification, which are similar in scope to NEPA and CEQA documents. Direct experience in transportation design for Caltrans, demonstrating expertise in Caltrans design standards and specification.

Relevant Experience

Maly-Ann Bory is a design engineer who has served on a variety of design and improvement projects for roadways and interchanges throughout California. She has experience with Caltrans design standards and is highly proficient with industry-standard design tools. She also provides traffic and transportation analysis for energy project AFCs.

Representative Projects

Mariposa Energy Project (MEP) Application for Certification (AFC); Mariposa Energy, LLP; Alameda County, California. Authored the Traffic and Transportation section for the MEP AFC. The project consisted of a natural gas-fired, simple-cycle electrical generating facility rated at a nominal generating capacity of 200 megawatts.

Almond 2 Power Plant (A2PP) AFC; Turlock Irrigation District; Ceres, California. Authored the traffic and transportation section for the A2PP AFC. The project consisted of a natural gas-fired, simple-cycle peaking facility rated at a gross generating capacity of 174 megawatts.

Contra Costa Generating Station; Radback Energy Inc., Oakley, CA. Prepared the Traffic and Transportation section of the AFC.

Norris Canyon Direct High-Occupancy Vehicle (HOV) Project Study Report (PSR); Contra Costa Transit Authority, San Ramon, CA. Developed design alternatives for direct HOV ramps to a new interchange at Norris Canyon. Created horizontal and vertical alignments and corresponding pavement delineation plans using Microstation V8. Prepared typical cross sections.

San Diego Association of Governments (SANDAG) On-call Engineering; San Diego, CA. Prepared typical cross sections of the mainline using Microstation V8. Checked existing ramps and connectors for horizontal alignments and diverge/merge angles to ensure they met current design standards. Prepared cost estimates for roadway items removal.

I-80 at Truckee River Canyon Pavement Replacement; Caltrans District 3, Sierra and Nevada Counties, CA. Created horizontal and vertical alignments of the mainline and temporary construction crossovers using Inroads XM and Microstation V8. Identified, prepared, and documented all design exceptions. Prepared the design checklist.

Chevron Richmond Refinery Power Plant Replacement; Chevron, Richmond, CA. Prepared the Traffic and Transportation section of the Small Power Plant Exemption (SPPE).

Mariposa Energy Center; Diamond Energy Corporation; Alameda County, CA. Prepared the Traffic and Transportation section of the AFC.

Fontana Energy Center; Calpine, Fontana, CA. Prepared the Traffic and Transportation section of the AFC.

Ivanpah Solar Electric Generating System; Bright Source Energy, San Bernardino County, CA. Prepared the Traffic and Transportation section of the AFC.

Carlsbad Energy Center; Carlsbad Energy Center LLC, Carlsbad, CA. Prepared the Traffic and Transportation section of the AFC.

Russell City Energy Center; Russell City Energy Center LLC, Russell City, CA. Prepared the Traffic and Transportation section of the AFC.

GWF Tracy Combined Cycle Power; Tracy, CA. Prepared the Traffic and Transportation section of the AFC.

Todd Ellwood
Project Biologist
CH2M HILL
8 Charles Hill Circle
Orinda, CA 94563
(408) 839-2402

Education

B.S., Renewable Natural Resources (Emphasis in Wildlife and Fisheries Science), University of Arizona, 1997

Professional Registrations

Department of Fish and Game Scientific Collecting Permit, #SC-006065, 2011

Distinguishing Qualifications

- Expertise in biological resource construction mitigation monitoring
- Knowledgeable with California wildlife natural history including identifying herpetile, mammalian, and bird species

Relevant Experience

As a biologist his experience includes performing general and special-status wildlife surveys. His has a knowledge of invertebrate and vertebrate natural history and identification of herpetile, mammalian and bird species. He is familiar with state (California) and federal regulations pertaining to both wetland and wildlife issues. He prepares biological assessments for special-status species and conducts site assessment surveys. Mr. Ellwood has extensive experience as an environmental inspector and biological monitor for construction projects in California. He has over 10 years experience working on applied environmental problems in terrestrial and aquatic habitats in the greater San Francisco Bay Area.

Project Experience with Special-Status Species

California red-legged frog (*Rana draytonni*)
California tiger salamander (*Ambystoma californiense*)
San Francisco garter snake (*Thamnophis sirtalis tetrataenia*)
Giant garter snake (*Thamnophis gigas*)
Alameda whipsnake (Masticophis lateralis)
California horned lizard (*Phrynosoma coronatum frontale*)
California legless lizard (*Anniella pulchra*)
Western pond turtle (*Clemmys marmorata*)
Steelhead (*Oncorhynchus mykiss*)
Vernal pool branchiopods
Bay checkerspot butterfly (*Euphydryas editha bayensis*)
San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*)
San Joaquin kit fox (*Vulpes macrotis mutica*)
Western burrowing owl (*Athene cunicularia hypugea*)

Representative Projects

Biological Monitor, Electrical Power Plants (Metcalf Energy Center, Los Esteros Critical Energy Facility, Gilroy Energy Center, Walnut Energy Center, Sutter Energy Center), Northern California. Coordinated daily biological monitoring of project construction activities and administered WEAT as the CEC-approved biologist. Performed biological surveys to determine suitable habitat for sensitive plant and wildlife species. Performed breeding bird surveys during construction. Post-construction conducted avian collision survey along the new electrical transmission lines. Performed protocol-level surveys for Western burrowing owl. Performed focused surveys (non-protocol) for California red-legged frog, American bullfrog, California tiger salamander, Western pond turtle, and the Bay Checkerspot butterfly. Verified compliance with the project's SWPPP. Submitted a monthly Environmental Compliance Report to the CEC.

Project Biologist, PG&E Maxwell 1101 Reconductoring Project, Colusa County, CA. Prepared a Biological Assessment for giant garter snake. Supervised a team of biological monitors during project construction and ensured no take of giant garter snake.

Environmental Inspector/Specialty Monitor, Hetch Hetchy Water System Improvement Program – Sunol Valley Region, San Francisco Public Utilities Commission, Alameda County, California. Conducts daily inspections for compliance with Project's permits issued by USFWS, USACE, CDFG, and RWQCB. Also as the specialty monitor, serves as a USFWS-approved biologist during site surveys for San Joaquin kit fox, California red-legged frog, California tiger salamander and Alameda whipsnake. Approved by the USFWS to capture and relocate CRLF, CTS, and AWS and administer the WEAT.

Project Biologist, Mariposa Energy Project, Alameda County, California. Task managed and/or self-performed all biological resources surveys in support of the project's CEQA-equivalent CEC Application for Certification and USFWS Biological Assessment addressing project effects on San Joaquin kit fox, California red-legged frog, California tiger salamander, vernal pool fairy shrimp, and longhorn fairy shrimp. Field surveys completed include general site assessments for listed species, wetland delineation, protocol-level botanical surveys, and protocol-level burrowing owl surveys. Coordinates regularly with resource agencies including USFWS, USACE, CDFG, and RWQCB.

Project Biologist, Confidential Wind Farm Client, California. Task managed and/or self-performed all biological resources surveys including habitat characterization, wetland delineation, site assessments for San Joaquin kit fox, California red-legged frog, and California tiger salamander. Also prepared the project's Biological Assessment and is overseeing other permitting aspects including CWA 404/401 and CDFG 1602. Coordinates regularly with resource agencies including USFWS, USACE, CDFG, and RWQCB.

Biologist, East Altamont Energy Center, Alameda County, California. Assisted with preparation of the Biological Resource Mitigation Implementation and Monitoring Plan, Erosion Control and Revegetation Plan, Avian Collision Monitoring Plan and Horizontal Directional Drilling Inadvertent Returns Contingency Plan.

Task Leader/Biologist, Caltrans District 4 Pigeon Pass Roadway Realignment Project, Alameda County, California. Managed team of field biologists during the

construction phase of the project. Field tasks included preconstruction surveys for California tiger salamander, California red-legged frog, and San Joaquin kit fox. Under conditional approval by USFWS, conducted burrow surveys for aestivating California red-legged frog and California tiger salamander using a peeper scope and hand excavation. Also captured and relocated San Francisco dusky-footed woodrat under authorization by CDFG. Field duties also included surveys for active bird nests and biological construction monitoring.

Associate Scientist, Caltrans District 4 Red Top Road Truck Climbing Lane Project, Solano County, California. Prepared and submitted applications for state and federal permits under Section 7 of the Federal Endangered Species Act; CDFG Lake and Streambed Alteration; and Clean Water Act, Sections 401 and 404. Mapped locations of sensitive habitats, which included Waters of the U.S. and habitat for California red-legged frog.

Biologist, Pacific Gas and Electric's Vaca-Dixon Transmission Line Project, Solano County, California. Under direction of a permitted biologist, performed weekly wet season sampling for state and federally listed Branchiopods including vernal pool fairy shrimp (*Branchinecta lynchi*) and tadpole shrimp (*Lepidurus packardi*).

Biologist, California Water Company Bear Gulch Creek Fish Screen Project, San Mateo County, California. Conducted preconstruction surveys for California red-legged frog, San Francisco garter snake, and steelhead. Captured and relocated steelhead from within project site using seines and dip nets as authorized by National Marine Fisheries Service biological opinion. Monitored construction activities for compliance with state and federal permits.

Biologist, Army Corps of Engineers, Fort Ord Natural Reserve, Groundwater Extraction Treatment System Expansion Project, Former Fort Ord, Monterey County, CA. Ensured protection of the Reserve's special-status plants and wildlife through implementation of applicable environmental mitigation guidelines. Assisted in identifying and clearly delineating the least damaging access routes and staging areas through the local chaparral habitat. Advised project personnel on how to protect special-status wildlife including California black legless lizard, Monterey ornate shrew (*Sorex ornatus salarius*), and coast horned lizard and special-status plants including sand gilia (*Gilia tenuiflora arenaria*), Monterey spineflower (*Chorizanthe pungens pungens*), and sandmat manzanita (*Arctostaphylos pumila*).

Biologist, Caltrans District 4 Devil's Slide Project, San Mateo County, California. Member of field team that conducted bird nest and San Francisco dusky-footed woodrat surveys for the Devil's Slide Tunnel Project; and biological monitoring for California red-legged frog during construction of the project's Charthouse Mitigation Site.

Biologist, Santa Clara Valley Water District's Lower Silver Creek Flood Protection Construction Project, Santa Clara County, California. Performed capture/relocation of native vertebrates, reaches 1, 2 and 3 of Lower Silver Creek. Capture techniques included use of seines, dip nets, and electroshock.

Biologist, Olivehurst Wastewater Treatment Plant, Yuba County, California. Conducted aquatic vertebrate salvaging using seines and giant garter snake preconstruction surveys prior to installation of the Project's stormwater outfall into a nearby canal.

Field Team Member, Western Area Power Authority, Northern California. Conducted surveys for threatened and endangered wildlife along an electrical transmission line. Also used a habitat classification system to map (using Trimble GPS) sensitive areas including seasonal wetlands and vernal pools.

Biologist, Santa Clara Valley Water District's Lower Silver Creek Flood Protection Project, Santa Clara County, California. Implemented a Mitigation Monitoring Plan annually for created wetlands, riparian/stream-riverine, and upland habitats. Also coordinated periodic environmental compliance monitoring of project's construction activities. Verified compliance with the project's SWPPP. Administered the project's environmental awareness training.

Biologist, Pacific Gas and Electric, Jefferson Martin 230kV Project-San Mateo County; TriValley Project, Contra Costa County, California. Coordinated and conducted field assignments related to the San Francisco dusky-footed woodrat, a California species of special concern. Also conducted SWPPP performance verification inspections.

Team Member, United States Fish and Wildlife Service, Upper Penitencia Creek Habitat Evaluation Procedures, Santa Clara County, California. Conducted a habitat evaluation of the Penitencia Creek Riparian Corridor. Collected data using a hypsometer, spherical densiometer and other data collection tools. Assessed general habitat suitability for fish and wildlife species against community-based models.

Biologist, City of San Jose Water Company, Lexington Reservoir Main Feed Reconstruction Project, Santa Clara County, California. Performed reconnaissance-level survey to assess general habitat value for sensitive wildlife species along the proposed pipeline alignment. Assisted with project's application for a California Department of Fish and Game Streambed Alteration Agreement under a Categorical Exemption.

Biologist, Geothermal Inc. Landfill Closure, Lake County, California. Performed an emergence count of Yuma myotis (*Myotis yumanensis*) and Mexican free-tailed bat (*Tadarida brasiliensis)* using ambient light. Observed acoustic monitoring using an ultrasonic detection system (e.g., Anabat). Performed species identification using a suite of morphological and physiological characteristics.

Associate Scientist, Town of Windsor Eastside Road Storage Project, Sonoma County, California. Performed periodic Stormwater Pollution Prevention Plan (SWPPP) site inspections. Also prepared an application for Lake or Streambed Alteration with the California Department of Fish and Game.

Professional Development

- Surveying and Identification Techniques Workshop-Amphibians of the San Francisco Bay Area, The Wildlife Society, 2002.
- Environmental Avoidance and Mitigation training related to Telecommunications projects, Jones and Stokes Associates, March 2000.
- 40-hour Hazardous Waste Operations and Emergency Response Training, 8-hour Refresher Course, 2004.

References

Debra Crowe, CH2M HILL

Richard Crow, CH2M HILL

John Cleckler, CH2M HILL

Matthew Franck

Water Resources

Education

Bachelor of Science, Environmental Policy Analysis and Planning, University of California at Davis, 1989

Years Experience

20

Relevant Experience

Mr. Franck is an environmental planner with CH2M HILL. He has 15 years of experience in managing and writing environmental impact assessment documents in compliance with NEPA and CEQA. He also coordinates local, state, and federal regulatory processes. Mr. Franck's education and multidisciplinary experience, as well as his expertise in land use and resource planning, provide a solid background for evaluating complex environmental policy issues.

Representative Projects

Humboldt Bay Repowering Project, PG&E. Task Manager for Water Resources. Prepared Water Resources analysis for a project to repower the existing Humboldt Bay Power Plant south of Eureka, California, using ten natural gas powered reciprocating engine generators. Key water resources issues of concern included stormwater quality to an extended detention basin, process wastewater discharges to a municipal system, and the decrease in lagoon flows because of reduced use of the existing once-through cooling system.

Ivanpah Solar Electric Generating System, Bright Source Energy, Inc. Senior Technical Reviewer for Water Resources. Assisted in the preparation of a Water Resources analysis as a Senior Technical Reviewer. Project is a concentrated solar thermal facility proposed on 1,843 acres of land in the Mojave Desert. Key water resources issues of concern included availability of groundwater for the thermal facility and the disturbance to hydrology from the large construction site.

Carlsbad Energy Center Project, NRG, Inc. Task Manager for Water Resources. Prepared Water Resources analysis for a project to repower the existing Encina Power Station in Carlsbad, California, using natural gas turbines. Project involved the use of reclaimed water from the nearby wastewater treatment plant, with an alternative source to use desalinated seawater. Key issues included marine impacts from seawater intake, brine disposal, and the capacity of the existing reclaimed water distribution system.

Lompoc Wind Energy Project, Pacific Renewable Energy Generation, LLC. Task Manager for Water Resources. Prepared Water Resources analysis for a project to install 60-80 wind turbines and ancillary facilities on 2,950 acres in Santa Barbara County, California. Key water resources issues of concern included disturbance to onsite water resources from the large extent of

construction activities, stormwater quality control, and development of an onsite facilities (including a well and septic system) for the operations units.

Eastshore Energy Project, Tierra Energy, Inc. Task Manager for Water Resources. Prepared Water Resources analysis for a new natural gas power plant in Hayward, California, using fourteen reciprocating engine generators. Key water resources issues of concern included the development of structural features for onsite stormwater quality control, and process wastewater discharges to a municipal system.

Westley-Marshall Substantion and Transmission Line Project, Turlock Irrigation District. Task Manager for Water Resources. Prepared Water Resources analysis for a transmission line project (approximately 12 miles) in rural Stanislaus County, California. The project also involved nine potential substation sites. Key water resources issues of concern included floodplain risks and stormwater quality control during construction.

AFCs for Walnut Creek Energy Park and Sun Valley Energy Project, Edison Mission Energy, City of Industry/Romoland, California (200 to 2006). Provided support for two Applications for Certification before the California Energy Commission for similarly designed 500-MW natural gas-fired peaking power plants using the GE LMS100 advanced gas turbine technology. These applications were prepared in parallel and were filed at the Energy Commission within one week of one another. The AFCs were filed in December of 2005 and the projects are scheduled to begin construction in 2007.

AFC for Roseville Energy Park, Roseville Electric, Roseville, California (2003 to 2005). Provided support for Application for Certification before the California Energy Commission for a 160-MW natural gas-fired power plant in Roseville, California.

Natomas Basin Habitat Conservation Plan, City of Sacramento and Sutter County, California. Assistant Project Manager for the environmental evaluation of the revised Natomas Basin HCP. The EIS/EIR evaluated the environmental consequences associated with implementing the activities covered by the HCP, including 17,500 acres of urban development, management of canals and drains by local water agencies, and development and management of an 8,750-acre system of habitat reserves by the Natomas Basin Conservancy.

Marshall W. Graves, Jr.
3303 California Avenue
Carmichael, CA 95608
(916) 944-4108 home
marshall.graves@comcast.net

Personal Profile

Education and Professional Training

Academic : MSEME (Mechanical Engineering, Automotive), University of Michigan
BSEME (Mechanical Engineering, Automotive), University of Michigan

Training : Government Contract Administration, General Services Administration, Washington, DC
Strategic Planning, Achievement Associates, Rockville MD
Total Quality Management, Dr. Edwards Deming

Relevant Experience

Engineering and Aviation Consultant (Current)
Governor's Office of Planning and Research, Emerging Technology Working Group
Executive Director, California Commission on Tax Policy in the New Economy
California State Fellow, American Society of Mechanical Engineers
Chief of Aviation, California Department of Forestry and Fire Protection
Consultant to Alameda Reuse and Redevelopment Authority
Advisor to East Bay Conversion and Reinvestment Commission
Commander, U.S. Navy / Career Naval Aviator

Credentials

FAA Airline Transport Pilot, Airplane Multi-Engine
Commercial Helicopter Pilot
Registered Professional Engineer, Mechanical, California

Affiliations

California Legislative Council of Professional Engineers
American Society of Mechanical Engineers
Society of Automotive Engineers
Flying Samaritans Board of Directors, Mother Lode Chapter

Achievements

United States Congressional Citation, 1995
Awarded for outstanding public service to the citizens of Alameda and the San Francisco / East Bay communities during the Naval Air Station Alameda base closure process.

Society of Automotive Engineers Ralph R. Teeter Award, 1981
Chosen as one of the 25 Outstanding Engineering Educators in the United States and Canada while assigned to the faculty of the U.S. Naval Academy.

Top Graduate, Naval Aviation Officer Candidate School, 1972
Ranked number 1 of 43 Naval aviation officers in commissioning class 38-71.

Marshall W. Graves, Jr.
3303 California Avenue
Carmichael, CA 95608
(916) 944-4108 home
marshall.graves@comcast.net

Civilian Experience

President / CEO, International Institute for Aviation, Science and Technology — Current

Perform aviation program reviews, aviation safety audits and cost benefit analyses for commercial and government aviation programs. Review / write standard operating procedures. Write training manuals. Aviation Safety and Aviation Business Practices Instructor for the University of California, Davis Extension.

Executive Director, California Commission on Tax Policy in the New Economy — 2002-2003

Chairman Bill Rosendahl (currently Los Angeles City Council member). Coordinated activities for nine Commissioners appointed by the Governor and Legislature, and nine ex-officio members assigned by statutory authority. Principal liaison to Senate and Assembly members and staffs to evaluate proposals for revising tax and revenue policies and formulating concepts for structural reform of the California budget. Drafted executive correspondence between the Chairman and Commissioners and the Office of the Governor. Organized hearings, scheduled state and local officials and advocacy groups as speakers, published agendas and proceedings, arranged for media coverage, maintained Commission website. Created PowerPoint presentations for the Chairman. Published *Interim Report*, *Options for Revising the California Tax System*, and *Final Report*.

California State Fellow, American Society of Mechanical Engineers — 2001-2002

Fellowship sponsored at the California Technology Trade and Commerce Agency. Provided engineering and policy guidance in support of advanced technology programs for the executive and legislative branches of California state government. Member of the Governor's Emerging Technology Working Group. Wrote a successful grant application to the Small Business Administration, Office of Technology to provide seed money (Small Business Innovative Research Program) for women and minority entrepreneur business enterprises. Organized Nanotechnology Forum for the Legislature's Joint Committee on Preparing California for the 21st Century. Organized Working Group for Cal-EPA / ARB on issues related to Vehicle Fuel Cell Technology.

Director of Aviation, Intel Corporation — 2000-2001

Implemented an in-house, regional jet, air shuttle program connecting five city pairs, providing scheduled service for 175,000 passengers on an annual basis. Accountable for all flight operations, aircraft maintenance and aviation safety programs. Worked with the Federal Aviation Administration and National Transportation Safety Board officials to ensure regulatory compliance of mishap plan and casualty assistance and biohazard response plans. Negotiated multi-year aviation services contract. Managed a $33 million annual operating budget.

Chief of Aviation, California Department of Forestry and Fire Protection — 1996-2000

Responsible for 24 hour / day flight operations, maintenance, and safety programs for 55 airplanes and helicopters deployed to 22 firefighting airbases. Drafted press releases for Public Affairs Officer. Accountable for aircraft inventory worth $200 million. Directed a $72 million aircraft modernization program. Flew back-up fire suppression missions in OV-10 aircraft. Managed a $49 million operating budget.

Base Reuse and Closure Consultant, Private Practice — 1995-1996

Evaluated the Naval Air Station Alameda industrial complex for the Alameda Reuse and Redevelopment Authority during base closure drawdown. Advisor to the East Bay Conversion and Reinvestment Commission.

Marshall W. Graves, Jr.
3303 California Avenue
Carmichael, CA 95608
(916) 944-4108 home
marshall.graves@comcast.net

Military Experience

Director of Operations, Naval Aviation Depot, Alameda, CA 1990-1995

Commander, U.S. Navy. Supervised 2,500 civilian employees overhauling A-6, P-3, and S-3 aircraft. Maintained engineering, modification and structural repair standards for 500 P-3 and 120 S-3 aircraft in the Navy inventory. Flew test flights in A-6 and S-3 jets. Managed HAZMAT and environmental permitting programs. Team leader for creating a five year operational and capital improvement strategic plan. Primary liaison to San Francisco, Oakland and East Bay communities during base closure, giving numerous presentations at public forums / town hall meetings. Advisor to Congressman Ronald Dellums District Office. Public Affairs Point of Contact for Alameda and Oakland media representatives. Accountable for a $350 million annual budget.

Powerplants Class Desk, Commander, Naval Air Force, U.S. Pacific Fleet 1987-1990

Responsible for all levels of maintenance and for approving all powerplant changes for 6,000 Pacific Fleet aircraft engines worth $4.2 billion. Developed integrated logistics and maintenance support plans for the fleet introductions of the F404 jet engine (F/A-18 fighter), the T700 engine (SH-60B helicopter), and the T427 engine (E-2C turboprop). Supervised a direct staff of eight and indirect staff (Western Pacific) of several thousand.

Executive Officer, Naval Plant Representative Office, Sikorsky Aircraft, Stratford, CT 1984-1987

Administered world-wide DOD and Coast Guard production and overhaul contracts worth $1.8 billion. Personally supervised the White House contract for the overhaul of the U.S. Presidential helicopter fleet. Top Secret Security Clearance (Presidential access). Joint Service Standardization Instructor Pilot for all models of the H-60 helicopter. Flew test flights in H-60 Blackhawks and Seahawks and Presidential VH-3D helicopters.

Air Operations Officer, Amphibious Squadron Seven 1982-1984

Planned and executed all flight operations for a combined USS Peleliu and USS Ranger amphibious / carrier battle group in preparation for combat operations in Lebanon. Responsible for Battle Group threat assessment and countermeasures. Drafted command and control strike plans. Combat Information Center Watch Officer / Strike Coordinator. Flew combat assault and search and rescue missions in UH-1N helicopters. Aviation Liaison Officer to Japanese, Korean, Australian, and Canadian forces during joint amphibious assault exercises.

Instructor, Mechanical Engineering, U. S. Naval Academy, Annapolis, MD 1979-1982

Taught courses in Compressible Flow and Turbomachinery, Fluid Mechanics, Thermodynamics, and Statics. Flew aviation indoctrination flights and taught seamanship classes for midshipmen during summer recess.

Combat Pilot, Helicopter Antisubmarine Warfare Squadron Thirty Six 1976-1979

Officer-in-Charge Detachment Six. Deployed with USS Saratoga Battle Groups. Flew combat support from Navy destroyers and cruisers in SH-2F helicopters. Navy finalist for astronaut training.

Operational Test and Evaluation Pilot, Air Test and Evaluation Squadron One, Patuxent River, MD 1973-1976

Flew antisubmarine test flights in S-2E/G airplanes, SH-3H and SH-2F helicopters. Wrote test plans, analyzed test data, and drafted final reports. Top Secret publications, cryptography, and equipment control officer.

JAMES A. GWERDER
105 E. 10th Street Tracy, California 95376 Telephone: (209) 835-8330

Position: Broker Associate, VP Consulting *Souza Realty & Development*
Property Manager *A. Souza & Son*

Date of Birth: April 4, 1963

Licenses: State of California Department of Real Estate Salesperson License, July 1989
State of California Department of Real Estate Broker License, since August 1993

Education

Bachelor of Science, Business Administration, California State University Stanislaus, 1995 *(Cum Laude)*
Urban Land Institute Real Estate Development Certificate, 1995
Associate in Arts (*Honors*), Business Concentration, San Joaquin Delta College, 1989
Technical and professional military training, United States Air Force 1981-1986
California General Education Diploma, 1980
Tracy High School, 1979
Bellarmine College Preparatory, 1978 and 1980

Real Estate Appraisal courses to include:
- The Basics of Appraisal, May 1993
- Real Estate Analysis, February 1993
- Sales Comparison Approach, February 1993
- Cost and Income Approaches and Valuation of Partial Interests, March 1993
- Appraisal Standards and Ethics, March 1993

Various professional courses for attaining and maintaining real estate licenses to include:
- Real Estate Principles, January 1989
- Real Estate Finance, July 2009
- Residential Real Estate Appraisal, November 1991
- Real Estate Practice, December 1992
- Legal Aspects of Real Estate, July 2005
- Ethics and Professional Conduct, July 2009
- Agency-Relationships, Duties, and Disclosures, July 2009
- Fair Housing, July 2009
- Trust Fund Handling, July 2009
- Limited Liability Companies for Group Investment, August 2001
- 1031 Reinvestment Plan, August 2001
- Protect Yourself and Your Clients, August 2009
- Risk Management, July 2009

Various courses and workshops offered by the Urban Land Institute to include:
- Real Estate Development Process Part I, June 1991
- Real Estate Development Process Part II, June 1992
- Industrial and Business Park Development, April 1994
- Innovations in Real Estate Ownership and Finance, February 1995
- Presenting a Winning Financing Package, April 1995
- Advanced Development Process: Residential, June 1995

Other professional development courses and seminars to include:
- Dale Carnegie Course in Effective Speaking and Human Relations, July 1989
- Federal Election Commission Federal Campaign Treasurer Conference, March 1992
- Advanced Integration Methods FoxPro for Windows Training, September 1993
- International Right of Way Association EMF seminar, February 1995
- ALI-ABA/CEB Course in Eminent Domain and Land Valuation Litigation, January 1996
- UC Davis Conference on Regional Habitat and Species Conservation Planning, September 1996
- CLE International Course in Eminent Domain, November 1999
- CLE International Wetlands Conference, September 2001
- USFWS/CDFG/NMFS Habitat and Species Conservation Planning Conference, October 2001

SJC Farm Bureau Land Trust Conference- Panelist, January 2002
NCRCPP Habitat Conservation Planning Tahoe to Bay Workshop-Panelist, November 2005 and 2009
APA Seminar Planning Sustainable Valley Communities, October 2007

Previous Employment

A. Souza & Son-Tracy California, 1987 to present
See "Current Employment"
Collins Food Service-Tracy California, 1986-1987
Delivery
United States Air Force, 1981-1986
Integrated Communication, Navigation, and Electronic Countermeasures Systems Specialist
Inspected, installed, maintained and troubleshot integrated avionics systems.
Supervised avionics systems activities and personnel
Maintenance Operations Center Controller
Directed and controlled maintenance efforts on fleet of F-16 aircraft
Coordinated with support agencies to ensure all mission requirements were met
APAC-Tracy California, 1980-1981
Repair clamp assembly
Line supervisor

Professional Advisory Activities

Core Member, *Tracy Tomorrow Transportation Task Force,* 1989
Chairman, Circulation and Air Quality Elements Committee, *Tracy Urban Growth Management Plan Citizen's Committee*, 1991
Past Board Member, *San Joaquin County Taxpayer's Association*
Landowner Representative, *Tri-County Wind Energy Mitigation Program Management Team*
Participant, *Alameda-Contra Costa Biodiversity Working Group East County Pilot Project Task Force*
Coordinator, *Byron Municipal Advisory Council General Plan*
Core Member, *Tracy Tomorrow 2000 Land Use Task Force*
Landowner Representative, *East Contra Costa County Habitat Conservation Plan Advisory Committee*
Member, *East Contra Costa Habitat Conservancy Public Advisory Committee*

Community Involvement

Member, *Land Use Task Force* of the *Contra Costa Council*
Past Board Member, Newsletter Editor, Membership Chairman, *Tracy Kiwanis Club*
Board Member, Past Secretary, *Contra Costa County Citizens Land Alliance*
Member, *San Joaquin County Citizens Land Alliance*
Treasurer, *Richard Pombo for Congress,* 1992

Current Employment

A. Souza & Son-Tracy California, 1987 to 2006
Duties included:
Coordination of efforts to maintain beef cattle herd of approximately 500 brood cows
A. Souza & Son-Tracy California, 1987 to 2010
Property management of approximately 2,500 acres of Souza Family property
Souza Realty & Development-Tracy California, 1989 to present
Real estate marketing, leasing and sales
Consulting landowners on land use issues
Research and providing opinions of value
Providing litigation support services to attorneys to include research, consultation and exhibit preparation
Providing pre-litigation analyses to landowners
Land entitlement processing/development
Participate in management meetings concerning various aspects of A. Souza & Son and Souza Realty and Development

Dean E Harris
Geotechnical Engineer

Education

M.S., Civil Engineering, Georgia Institute of Technology
B.S., Civil Engineering, Georgia Institute of Technology

Professional Registrations

Professional Engineer: Idaho, Oregon, and Montana

Distinguishing Qualifications

Performed foundation engineering for industrial and office structures involving settlement sensitive projects on soft soil sites

Provided geotechnical engineering for numerous bridge projects requiring deep foundation behavior evaluation of driven piling and drilled shaft foundations

Experience in design and stability evaluation for solid waste landfill projects in several states

Provided stability analyses and design of sheet pile walls to control dredged, contaminated soils and water

Experienced in predesign of wastewater treatment plants

Performed stability analyses for water control structures

Relevant Experience

Mr. Harris is a geotechnical engineer in CH2M HILL's Boise, Idaho, office with 21 years of experience. He supervises geotechnical field investigations, evaluates laboratory testing information, and performs geotechnical engineering and pavement analysis for a variety of projects. Mr. Harris has extensive experience in foundation evaluation for various foundation types. This experience includes the evaluation of foundations in a wide variety of soil conditions from very challenging loose and soft soil, and foundations on dense sand and gravel where it is important to optimize foundation performance. His project experience has also extensive analysis of deep foundations, including driven piling, drilled shaft foundations, and auger cast foundations.

Mr. Harris has many years of experience in the planning and execution of field explorations for geotechnical engineering. He is familiar with many types of drilling equipment and methods, and with various types of in-situ testing such as Standard Penetration Testing, Cone Penetrometer Testing, and Pressuremeter testing. He is experienced in rock coring and has supervised coring on several projects.

Mr. Harris' experience in foundation evaluation includes the evaluation of spread-footing foundations, soft, fine-grained materials, loose sandy materials, dense sand and gravels, and rock. He has extensive knowledge and experience of the analysis, design, and construction of drilled shaft foundations, through his research and work experience. He also has experienced in the evaluation, design, and construction of driven pile foundations.

Representative Projects

Golden Crossing Constructors Joint Venture, Golden Ears Bridge Project – Unnamed Creek Crossing. The Unnamed Creek Crossing consists of proposed parallel structures that cross an existing high pressure oil pipeline and a small creek. The crossing location includes sloping ground that is comprised of soft to stiff clay with highly variable thickness, overlying dense till material. Mr. Harris performed the geotechnical engineering to characterize the shear strength and compressibility of the clay, including directing the laboratory testing which included advanced testing procedures such as direct simple shear, and cyclic direct simple shear testing. Mr. Harris also performed the slope stability analysis for static conditions to develop slope stabilization measures and developed shear strength properties for the seismic analysis. Mr. Harris also performed the analysis to estimate the axial resistance of the foundations. During construction, Mr. Harris developed an instrumentation plan for geotechnical monitoring, including limits for construction vibrations and pore pressures during earthwork and pile driving and evaluation of measurements from slope inclinometers. He performed the detailed analysis of the findings from the monitoring to verify that performance was within the expectations and to stop or limit work when necessary.

Base Relocation Project, Pyongtaek, Republic of Korea. Mr. Harris was the site geotechnical engineer for a project that involved development of new land for U.S. Army facilities, by the combined use of prefabricated wick drains and several meters of engineered fill. Mr. Harris was responsible for providing geotechnical assistance during the development of conceptual designs, and for providing quality assurance during construction. He worked with the contractor's field construction staff to help develop procedures for maintaining production while compacting silty soil during a rainy season. Mr. Harris also worked with the contractors geotechnical engineering technicians to verify that settlement and pore pressure monitoring activities and reporting were adequate to evaluate the engineering behavior, and consistent with the requirements of the contract documents. He also provided direction to field quality assurance staff to develop procedures for monitoring the field compaction and rapidly document the findings from of testing.

US Army Corps of Engineers, Milltown Bridge Infrastructure Mitigation. This project involved the evaluation, design, and construction of settlement, slope stability and scour mitigation measures for existing Interstate bridges (I90) that were constructed on soft reservoir sediments in the Milltown Dam reservoir. Following removal of the dam, as part of a US EPA superfund project, contaminated reservoir sediments were removed, and the Blackfoot and Clark Fork Rivers were returned to a free-flowing state. The reservoir drawdown and subsequent scour potential created risk for settlement and stability damage to the bridges. Mr. Harris planned and supervised the evaluation of geotechnical issues, and the design of mitigation measures that included jet grouting and micropile slope stabilization measures. He supervised the observation of geotechnical instrumentation (slope inclinometers and pore pressure gauges) through construction and provided direction to the client to maintain safety and stability during construction.

Idaho Transportation Department, U.S. 95, Sand Creek Byway, ID. The Sand Creek Byway is a realignment of Idaho's major north-south transportation corridor in the vicinity of Sandpoint Idaho. The location of the project includes soft clay soil that extends to depths of several hundred feet. Mr. Harris planned and supervised the geotechnical work for this project. The project includes numerous bridges and retaining walls and required the use of numerous advanced engineering techniques and ground improvement and construction technologies. These include the use of in-situ and laboratory testing of soft clay to evaluate

compressibility and strength parameters, numerical analyses to evaluate settlement and stability, plus techniques such as prefabricated vertical drains (wick drains), cement deep soil mixing, and cellular concrete lightweight fill.

Department of Defense

Ft. Custer Army Reserve Center, Ft. Custer Michigan. Mr. Harris served as the Senior Geotechnical Engineer directing and managing the geotechnical exploration and analysis for this facililty. The project included a one-story CMU structure to be constructed on challenging conditions that included very loose to loose sand. The project also included extensive parking and storage facilities for passenger vehicles and military equipment.

Geotechnical Engineer; Enhanced Training in Idaho, Design/Build; USACE; Mountain Home AFB, Idaho. Provided engineering for a $18 million design-build remote-training range which provides the U.S. Air Force with a comprehensive facility to train personnel in air-to-air and air-to-ground fighting missions. Evaluated foundation alternatives and developed foundation recommendations for numerous structures in an area with shallow rock and frost heave considerations. Directed the evaluation of small drilled shaft foundations into rock for resistance to high overturning and moment loads. Performed site inspections during construction to observe construction and develop construction procedures to make construction practical while meeting the owner's needs.

Transportation Experience

Mr. Harris has performed geotechnical engineering for numerous bridge projects for the Oregon Department of Transportation and the Idaho Transportation Department. His experience includes analysis of lateral and axial compression behavior of driven steel piles, and drilled shaft foundations socketed in rock.

Geotechnical Engineer; Ada County Highway District, Widening Federal Way, Boise, Idaho; 2002. Responsible for planning and supervising the field for the widening of Federal Way, a heavily traveled local road in Boise, Idaho. The project includes one structure, a pedestrian/bicycle bridge located adjacent to an existing vehicle bridge at an overpass. Because of the proximity to the existing structure, excavations for spread-footing foundations would have potentially undermined the existing structure, which is founded on shallow foundations. Therefore, drilled shaft foundations were selected for use in supporting the structure. Mr. Harris was responsible for planning and supervising the field exploration for this project. He developed a scope of laboratory testing and was responsible for supervising the testing. He performed the analysis of drilled shaft foundations to estimate axial load capacity and lateral resistance. He also contacted local and out-of-area drilled shaft contractors to assess construction issues for the project.

Idaho Transportation Department, U.S. 95, Worley to Mica Kootenai County, ID. Planned and supervised the geotechnical work for this project. The project included an extensive subsurface exploration necessary to evaluate conditions ranging from embankments and structures on very soft ground and very high cuts in weathered rock. He was responsible for directing the laboratory testing program, and for directing all slope stability evaluations and other geotechnical analysis.

Geotechnical Engineer; Table Rock Road Bridge; Medford, Oregon. The Table Rock Road Project involved replacement of an existing bridge over the Rogue River with a cast-in-place, post-tensioned structure with six spans. The subsurface conditions at the site included a surface layer of gravelly and sandy materials with occasional boulders ranging in thickness from less than 5 feet to around 40 feet. Beneath the gravelly material, the site included rock that varied from mudstone to sandstone, with occasional layers of coal. Because of the potential scour depths and the very high lateral and axial foundation loads, shallow, spread-footing foundations were found to be unsuitable for support of the structure.

Also, driven pile foundations were found to be unacceptable because they would not gain adequate penetration into the rock to develop sufficient lateral capacity during heavy scour events.

Mr. Harris was responsible for planning and supervising the field exploration, developing a scope of laboratory testing; evaluating foundation alternatives; estimating the axial capacity and lateral resistance of drilled shaft foundations, and preparing a geotechnical report to document the findings and recommendations. Evaluation of the potential drilling conditions in the gravelly material and in the rock was very important because of the concern for construction claims. Mr. Harris contacted many of the drilled shaft contractors to discuss the site conditions and evaluate the potential difficulties associated with the site. He also observed the construction of the initial shafts to confirm that the design requirements were met and to observe construction conditions.

Geotechnical Task Leade; Idaho Transportation Department, I-15, Clark Street Interchange to Pocatello Creek Interchange, Pocatello, Idaho; 1997. Responsible for all phases of the geotechnical exploration and analysis. Project included widening of the interstate and replacement of bridge structures at two locations: the Monte Vista Underpass (one structure) and the Pocatello Creek Road Overpass (two structures). The Monte Vista Underpass structure was situated at the top of a hill and included approximately 50 to 60 feet of loess overlying a sand and gravel formation. The Pocatello Creek Road Overpass structures were located in an area with only several feet of soft material overlying the dense sand and gravel formation. Driven H-pile foundations were selected for each of the structures because of the anticipated hard driving conditions. Mr. Harris was the geotechnical task leader and was responsible for all phases of the geotechnical exploration and analysis. He developed recommended bearing capacities for the pile foundations, and performed wave equation analysis to evaluate pile-driving conditions and recommend acceptable hammer types and termination criteria for the piles.

Wastewater Experience

Geotechnical Engineer; West Boise Wastewater Treatment Facility; Boise, Idaho. Responsible for developing technical requirements and planning the geotechnical exploration, observation of field explorations and laboratory testing, and performing geotechnical analysis for the project. Geotechnical challenges associated with this site included deep excavations below the groundwater level, adjacent to existing structures. Mr. Harris evaluated foundation stability and settlement and developed requirements for excavation support system and dewatering systems. He also was responsible for preparing technical specifications related to geotechnical engineering, such as subgrade preparation, excavation support systems, and dewatering. During project construction, Mr. Harris reviewed contractor submittals and observed construction activities by the contractor to verify compliance with specification requirements.

Foundations

Geotechnical Engineer, Saint Lukes Regional Medical Center, Boise Idaho. Mr. Harris has served as the lead geotechnical engineer or the Senior Geotechnical Engineer on multiple projects for St. Lukes Regional Medical Center, at the Boise, Meridian, and Twin Falls Idaho locations. These projects have ranged from foundation evaluation for new hospital and office space, foundations for parking garages, and design of earth retention systems to allow excavations adjacent to existing hospital structures or Boise streets.

Geotechnical Engineer; City of Portland Bureau of Environmental Services; Water Pollution Control Laboratory, Portland, Oregon. Responsible for developing recommendations for driven foundations. Monitored installation and acceptance of the piles. This facility is a water quality lab located in very soft alluvial and dredged fill soils along the

Willamette River. The evaluation of the site included evaluation of site improvement techniques such as deep dynamic compaction and stone columns.

Previous Experience

As a graduate assistant, Mr. Harris was an instructor in soil mechanics laboratories. He also assisted in directing a drilled shaft load test program funded by the Federal Highway Administration and the Association of Drilled Shaft Contractors (ADSC). The load test program included characterization of a test site using a variety of field and laboratory testing methods and full-scale load testing of drilled shaft foundations.

Prior to graduate school, Mr. Harris worked as a project engineer for a geotechnical consulting firm in Florida. His experience there included supervision of field and laboratory testing activities and geotechnical engineering for projects including a $100 million renovation of a Titan rocket launch complex at the Cape Canaveral Air Force Station.

Clint Helton, RPA

Cultural Resources

Education

M.A., Anthropology

B.A., Language and Literature

Professional Registration

Registered Professional Archaeologist (1999, No. 11280)

Distinguishing Qualifications

- Strong background in environmental impact evaluations, with particular expertise in conducting cultural resources studies in California, Colorado, Idaho, Nevada, Utah, and Wyoming
- Has 13 years of environmental management experience in the western U.S.
- Meets Secretary of Interior Professional Qualification Standards (36 CFR 61)
- Highly experienced managing cultural resources studies for large linear transportation and utility projects to meet requirements of National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), California Environmental Quality Act (CEQA), and standards of the California Energy Commission (CEC), and Federal Energy Regulatory Commission (FERC)

Relevant Experience

Mr. Helton is an environmental consultant with more than 13 years of environmental management experience in the western United States. He has a strong background in environmental impact evaluations, having directed technical studies; negotiated with lead agencies, responsible agencies, and clients; and written, edited, and produced a substantial number of environmental review and technical documents. Mr. Helton has extensive experience of regulatory compliance, cultural and paleontological resources, NEPA and NHPA compliance activities, and federal regulations governing treatment of cultural resources, especially Section 106 of NHPA (36CFR800) and the Native American Graves Protection and Repatriation Act (NAGPRA) (43CFR10). Additionally, Mr. Helton is experienced with the challenges of preparing environmental documentation for large linear utility projects, including large interstate pipelines and is familiar with the process and guidelines of CEC and FERC among others. Mr. Helton has authored numerous environmental technical reports, cultural resources management plans, cultural resources studies, Programmatic Agreements, and Memorandums of Understanding (MOU) and contributed to many NEPA and CEQA documents for a variety of private and public sector clients.

Representative Projects

Mariposa Energy Project, Alameda County, California. Task Lead and overall management of cultural resources studies for the construction of a simple-cycle generating facility with a nominal capacity of 200-megawatts. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

Turlock Irrigation District Almond 2 Power Plant, Ceres, California. Task Lead and overall management of cultural resources studies for the construction of a simple-cycle peaking facility rated at a gross generating capacity of 174 megawatts. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

Carlsbad Energy Center Project, Carlsbad, California. Task Lead and overall management of cultural resources studies for the construction of a combined-cycle facility consisting of two natural-gas-fired turbines, heat recovery steam generators, steam turbine generators, and associated equipment. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

GWF Energy Tracy Combined Cycle Conversion Project, San Joaquin County, California. Task Lead and overall management of cultural resources studies for this conversion of an existing peaking plant to a combined-cycle baseload facility in San Joaquin County, California. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

BrightSource Energy, Ivanpah Solar Electric Generating System Project, San Bernardino County, California. Assisted with preparation of Application For Certification for California Energy Commission in support of a large proposed solar power generation facility covering over 4,000 acres of land managed by Bureau of Land Management in San Bernardino County, California. Responsible for preparation of cultural resources component of project, including archival research, field surveys, report preparation, and conducting Native American consultation.

Terra-Gen LLC Alta Wind Project, Kern County, California. Task Lead, quality control manager, and overall management of cultural resources studies for this 5,000-acre-plus alternative energy development project near the City of Tehachapi, Kern County, California. Provide regulatory guidance, regional technical expertise in cultural resources and coordination with Kern County. Supervised inventory for cultural resources, technical report preparation, and conducted Native American Consultation.

Iberdrola Renewables, Multiple Solar Energy Development Projects, Arizona, California, New Mexico, Nevada. Led preparation of cultural resources assessments for solar power generation facilities in Arizona, New Mexico, Nevada, and California. Mr. Helton is acting as principal investigator for several critical issues analyses as well as full permit preparation of solar energy development projects in Arizona, California, Nevada, and New Mexico. Project acreages range from 5,800 acres to 35,000 acres.

PPM Energy, Solar Energy Development, Arizona, Nevada, California. Cultural resources assessments for solar power generation facilities in Arizona, Nevada, and California. Mr. Helton

is acting as principal investigator for literature searches and field visits for several proposed solar energy projects in Arizona, California, and Nevada. Project acreages range from 2,000 acres to 25,000 acres.

Edison Mission Energy, Walnut Creek Energy Park Power Plant, California. Assisted with preparation of Application for Certification for California Energy Commission in support of this proposed 500-MW power generation facility in Los Angeles County, California. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

Edison Mission Energy, Sun Valley Energy Center Power Plant, California. Assisted with preparation of Application for Certification for California Energy Commission in support of this proposed 500-MW power generation facility in San Bernardino County, California. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

Chula Vista Energy Upgrade Project, MMC Energy, San Diego County, California. Task Lead and overall management of cultural resources studies for this 100-MW power plant upgrade project in San Diego County, California. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

CURRICULUM VITAE

Ronald A. Hess

Address: Department of Mechanical
and Aeronautical Engineering
One Shields Ave.
University of California
Davis, CA 95616-5294

Home - (530)-758-5070
Office - (530)-752-1513
FAX - (530)-752-4158
email - rahess@ucdavis.edu

Present Position:

Professor Department of Mechanical and Aerospace Engineering
One Shields Ave
University of California
Davis, CA 95616-5294

Current Research Interests:

1.) Aircraft dynamics, stability and control, vehicle handling qualities

2.) Automatic control

3.) Man-machine systems; Flight simulation

Education:

B.S. in Aerospace Engineering, 1965, University of Cincinnati

M.S. in Aerospace Engineering, 1967, University of Cincinnati

Ph.D. in Aerospace Engineering, 1970, University of Cincinnati

Experience:

1993 - 94, 98 – 2004, Vice Chairman, Dept. of Mechanical and Aeronautical Engineering

1984 - Professor, Department of Mechanical, and Aeronautical Engineering, University of California, Davis; Teaching undergraduate and graduate courses and conducting research in areas of mechanical and aeronautical engineering

1982 - 1984, Associate Professor, Department of Mechanical, Aeronautical, and Materials Engineering, University of California, Davis

1977 - 1982, Research Scientist, NASA Ames Research Center, Moffett Field, CA. Conducting and directing research in Advanced Vertical and Short Takeoff and Landing (V/STOL) aircraft; Specific research activity involved the automatic and manual control of V/STOL aircraft including rotorcraft

1975 - 1976, Assistant Professor, Department of Aeronautics, Naval Postgraduate School, Monterey, CA; Conducting on-sight research at NASA Ames Research Center. Research activity involved rotorcraft handling qualities prediction and cockpit display design

1970 - 1975, Assistant Professor, Department of Aeronautics, Naval Postgraduate School; Teaching graduate courses and conducting research in aeronautical engineering

Professional Activities:

Associate Editor, *Journal of Aircraft* (1977 -), an archival technical journal of the American Institute of Aeronautics and Astronautics (AIAA)

Associate Editor, *IEEE Transactions on Systems, Man, and Cybernetics*[1] (1980 -), *an archival technical journal of the Institute of Electrical and Electronics Engineers (IEEE)*

Associate Editor, Journal of Aerospace Engineering, Proceedings Part G of the Institution of Mechanical Engineers, Great Britain (1999 -)

Member, AIAA Technical Committee on Guidance Navigation and Control (1985 - 1988)

Member, IEEE Systems, Man, and Cybernetics Administrative Committee (1986 - 1989)

Member, SAE Aerospace Control and Guidance Systems Committee, (1998 -); Co-Chairman Subcommittee D, Dynamics, Computations, and Analysis (1999 -)

Chairman, IEEE Systems, Man, and Cybernetics Technical Committee on Manual Control (1986 - 2002)

Member, AIAA Technical Committee on Atmospheric Flight Mechanics (1988 - 1991), and (2006 -)

Vice-President, Membership, IEEE Systems, Man and Cybernetics Society (1989 - 1991)

Faculty Advisor, University of California, Davis Student Chapter of AIAA (1984 - 2002)

Member, National Research Council Committee on the Effects of Aircraft-Pilot Coupling on Flight Safety (1996-1997)

---

[1]*Since 1997, this journal has now split into three offerings: Part A: Systems and Humans, Part B: Cybernetics, and Part C: Applications and Reviews. Prof. Hess is an Associate Editor of Part A.*

Consulting Editor *International Journal of Applied Aviation Studies*, A Publication of the FAA Academy, Oklahoma City, Oklohoma, (2010 -

Member, National Research Council Committee for the Review of NASA's Revolutionize Aviation Panel for the Review of the Aviation Safety Program (2002-2003)

Member, National Transportation Safety Board Group investigation crash of American Airlines Flight 587, (2003-2004)

Member of five-person panel conducting peer review of the Dynamic Systems and Controls Branch at NASA Langley Research Center, Nov. 2005.

NATO Lecture Series Speaker: 2007 NATO/RTO Lecture Series LS-SCI-175; Rostock, Germany; and Florence, Italy; Davis, CA. USA: "System Control Technologies, Design Considerations & Integrated Optimization Factors for Distributed Nano Unmanned Air Vehicle Applications," to be held May, 2007.

Member of five-person panel conducting peer review of the Flight Dynamics Branch at NASA Langley Research Center, Oct. 2008.

Member of five-person panel conducting peer review of the Dynamic Systems and Controls Branch at NASA Langley Research Center, Nov. 2010

Professional Awards

IEEE Systems, Man, and Cybernetics Society *Outstanding Contribution Award*, October, 1995, Citation: "For leadership and continuing service as a Transactions Associate Editor, and for many contributions to research and scholarship."

AIAA *Mechanics and Control of Flight Award*, August, 2000, Citation: "For advances toward the design and analytical evaluation of flight control systems, emphasizing the safe piloted control of Aircraft,"

Best Paper Award, AIAA Atmospheric Flight Mechanics Conference, 2005. "Nonlinear Inversion Control for a Ducted Fan UAV," Co-authors: C. Spaulding (Prof. Hess' graduate student), M. Mansur, M. Tischler, and J. Franklin.

Best Paper Award, AIAA Aerospace Sciences Meeting, Atmospheric Flight Mechanics Sessions, 2008, Citation: "for the outstanding paper titled," "Metrics for the Evaluation of Pedal Force/Feel Systems in Transport Aircraft."

AIAA Atmospheric Flight Mechanics Conference Plenary Address, AIAA Atmospheric Flight Mechanics Conference, Honolulu, Hawaii, August, 2008, "Illuminating the Pilot Vehicle System," with David Klyde. This was the inaugural *McRuer Lecture* to be presented each year at the AIAA AFM Conference.

Professional Affiliations:

Associate Fellow, American Institute of Aeronautics and Astronautics (1986 -)

Senior Member, Institute of Electrical and Electronics Engineers (1991 -)

Member American Helicopter Society
Tau Beta Pi (Elected as Eminent Engineer in 1990)
Sigma Xi

Professional Engineering/Teaching Credentials:

Registered Professional Engineer in the state of California - Control Systems Engineering, Certificate No. CS001927 (1977 -)

California Community College Instructor Credential No. 208887, (1979 -)

Representative Archival Publications Over Last 22 Years[2] (1988 -); Complete list available on request

1.) Hess, R. A., and Chan, K. K., "Preview Control Pilot Model for Near-Earth Maneuvering Helicopter Flight," *Journal of Guidance, Control and Dynamics*, Vol. 11, No. 2, 1988, pp. 146-152.

2.) Hess, R. A., and Tran, P. M., "Pilot/Vehicle Analysis of a Twin-Lift Helicopter Configuration in Hover," *Journal of Guidance, Control and Dynamics*, Vol. 11, No. 5, 1988, pp. 465-472.

3.) Hess, R. A., and Jung, Y. C., "An Application of Generalized Predictive Control to Rotorcraft Terrain-Following Flight," *IEEE Transactions on Systems, Man, and Cybernetics*, Vol. 19, No. 9, 1989, pp. 955-962.

4.) Hess, R. A., "Theory for Aircraft Handling Qualities Based Upon a Structural Pilot Model," *Journal of Guidance, Control and Dynamics*, Vol. 12 No. 6, 1989, pp. 792-797.

5.) Hess, R. A., "Complex Dynamic Systems: Human Interaction," in *Systems and Control Encyclopedia, Supplementary Vol. 1*, Ed: M. G. Singh, Pergamon, 1990, pp. 73-80.

6.) Hess, R. A., "Human Factors Engineering: Information Processing Concerns," in *Concise Encyclopedia of Information Processing in Systems and Organizations*, Ed: A. P. Sage, Pergamon, 1990, pp. 217-223.

[2]Unless noted otherwise, all co-authors were graduate students of Prof. Hess

7.) Hess, R. A., "Methodology for the Analytical Assessment of Aircraft Handling Qualities," in *Advances in Aerospace Systems Dynamics*, Vol. 31, Ed: C. T. Leondes, Academic, 1990, pp. 129-149.

8.) Hess, R. A. "Identification of Pilot-Vehicle Dynamics from Simulation and Flight Test," in *Advances in Aerospace Systems Dynamics*, Vol. 31, Ed: C. T. Leondes, Academic, 1990, pp. 151-175.

9.) Hess, R. A., "A Model of the Human's Use of Motion Cues in Vehicular Control," *Journal of Guidance, Control and Dynamics*, Vol. 13, No. 3, May-June 1990, pp. 476-482.

10.) Hess, R. A., and Gorder, P. J., "Design and Evaluation of a Cockpit Display for Hovering Flight," *Journal of Guidance, Control, and Dynamics*, Vol. 13, No. 3, May-June 1990, pp. 450-457.

11.) Hess, R. A., "Analyzing Manipulator and Feel System Effects in Aircraft Flight Control," *IEEE Transactions on Systems, Man, and Cybernetics*, Vol. SMC-20, No. 4, July-August, 1990, pp. 923-931.

12.) Hess, R. A., and Malsbury T., "A Methodology for the Assessment of Manned Flight Simulator Fidelity," *Journal of Guidance, Control and Dynamics*, Vol. 14, No. 1, Jan.-Feb., 1991, pp. 191-197.

13.) Hess, R. A., and Kalteis, R., "Technique for Predicting Longitudinal Pilot Induced Oscillations," *Journal of Guidance, Control, and Dynamics*, Vol. 14, No. 1, Jan.-Feb., 1991, pp. 198-204.

14.) Hess, R. A., Gao, C., and Wang S. H.,[3] "Generalized Technique for Inverse Simulation Applied to Aircraft Maneuvers," *Journal of Guidance, Control, and Dynamics*, Vol. 14, No. 5, Sept.-Oct., 1991, pp. 920-926.

15.) Jung, Y. C., and Hess, R. A., "Precise Flight-Path Control Using a Predictive Algorithm," *Journal of Guidance, Control, and Dynamics*, Vol. 14, No. 5, Sept.-Oct., 1991, pp. 936-942.

16.) Bolourchi, F., and Hess, R. A., "Nonlinear Model Reference Adaptive Control Using Tap-Delay Filters," *IEEE Transactions on Systems, Man, and Cybernetics*, Vol. 22, No. 2, March/April 1992, pp. 360-368.

17.) Hess, R. A., and Yousefpor, M., "Analyzing the Flared Landing Task with Pitch-Rate Flight Control Systems," *Journal of Guidance, Control, and Dynamics*, Vol. 15, No. 3, May-June, 1992, pp. 768-774.

---

[3]Professor, Dept. of Electrical Engineering and Computer Science, University of California, Davis

18.) Hess, R. A., Malsbury, T., and Atencio, A., Jr.,[4] "Flight Simulator Fidelity Assessment in a Rotorcraft Lateral Translation Maneuver," *Journal of Guidance, Control, and Dynamics*, Vol. 16, No. 1, Jan- Feb., 1993, pp. 79-85.

19.) Modjtahedzadeh, A., and Hess, R. A., "A Model of Driver Steering Control Behavior for Use in Assessing Vehicle Handling Qualities," *ASME Journal of Dynamic Systems*, Measurement, and Control, Vol. 115, No. 3, Sept. 1993, pp. 456-464.

20.) Hess, R. A., and Gao, C., "Generalized Algorithm for Inverse Simulation Applied to Rotorcraft Maneuvering Flight," *Journal of the American Helicopter Society*, Vol. 38, No. 4, Oct. 1993 pp. 3-15.

21.) Gao, C., and Hess, R. A., "Inverse Simulation of Large Amplitude Aircraft Maneuvers," *Journal of Guidance, Control, and Dynamics*, Vol. 16, No. 4, July-August 1993, pp. 733-737.

22.) Hess, R. A., and Gorder, P. J. "Quantitative Feedback Theory Applied to the Design of a Rotorcraft Flight Control System," *Journal of Guidance, Control, and Dynamics*, Vol. 16, No.4, July-August 1993, pp. 748-753.

23.) Hess, R. A., Rotorcraft Control System Design for Uncertain Vehicle Dynamics Using Quantitative Feedback Theory," *Journal of the American Helicopter Society*, Vol. 39, No. 2, 1994, pp. 47-55.

24.) Hess, R. A., "Rotorcraft Handling Qualities in Turbulence," *Journal of Guidance, Control, and Dynamics*, Vol. 18, No. 1, Jan-Feb., 1995, pp. 39-45.

25.) Yousefpor, M., Palazoglu, A.,[5] and Hess, R., "Robust Control Design for SISO Systems Based on Constrained Optimization," *International Journal of Control*, Vol. 62, No. 2, 1995, pp. 447-491.

26.) Hess, R. A., "Feedback System Design for Stable Plants with Input Saturation: *Journal of Guidance, Control, and Dynamics*, Vol. 18, No. 5, Sept.-Oct. 1995, pp. 1029-1035.

27.) Hess, R. A. and Henderson, D. K., "Flexible Vehicle Control Using Quantitative Feedback Theory," *Journal of Guidance, Control, and Dynamics*, Vol. 18, No. 5, Sept.-Oct. 1995, pp. 1062-1067

28.) Hess, R. A., and Snell, S. A.,[6] "Feedback Design for Unstable Plants with Saturating Nonlinearities, Single-Input, Single-Output, *Journal of Guidance, Control, and Dynamics*, Vol. 19, No. 1, Jan.-Feb. 1996, pp. 191-197.

---

[4]Aerospace Engineer, U.S. Army Aeroflightdynamics Directorate, NASA Ames Research Center.

[5]Prof. Dept. of Chemical Engineering and Materials Science, University of California,

[6]Assistant Professor, Dept. of Mechanical and Aeronautical Engineering, University of

29.) Hess, R. A., "Turbulence and Stability," in *The Engineering Handbook*, Ed: R. C. Dorf, CRC Press, Boca Raton, FL, Chap. 173, 1996.

30.) Hess, R. A., "Human-in-the-Loop Control" in *CRC Control Handbook*, Ed: W. S. Levine, CRC Press, Boca Raton, FL, Chap. 80, 1996.

31.) Hess, R. A., "Feedback Control Models, - Manual Control and Tracking," in *Handbook of Human Factors and Ergonomics*, 2nd Edition, Editor; G. Salvendy, Wiley, NY, Chap. 38, 1997.

32.) Hess, R. A., and Snell, S. A.,[6] "Flight Control System Design with Rate Saturating Actuators," *Journal of Guidance, Control, and Dynamics*, Vol. 20, No. 1, Jan.-Feb. 1997, pp. 90-96.

33.) Henderson, D. K., and Hess, R. A., "Approximations for Quantitative Feedback Theory Designs, *Journal of Guidance, Control, and Dynamics*, Vol. 20, No. 4, July-Aug., 1997, pp. 828-830.

34.) Gibson, J.,[7] and Hess, R. A., "Stick and Feel System Design," AGARD-AG-332, March, 1997.

35.) Hess, R. A., "Unified Theory for Aircraft Handling Qualities and Adverse Aircraft-Pilot Coupling," *Journal of Guidance, Control, and Dynamics*, Vol. 20, No. 6, Sept.-Oct., 1997, pp. 1141-1148.

36.) Gorder, P. J., and Hess, R. A., "Sequential Loop Closure in Design of Robust Rotorcraft Flight Control Systems, *Journal of Guidance, Control, and Dynamics*, vol. 20, No. 6, Nov.-Dec., 1997, pp. 1235-1240.

37.) Hess, R. A., "Theory for Roll-Ratchet Phenomenon in High-Performance Aircraft," *Journal of Guidance, Control, and Dynamics*, Vol. 21, No. 1, Jan.-Feb., 1998, pp. 101-108.

38.) Snell, A. S.,[6] and Hess, R. A., "Robust, Decoupled, Flight Control Design with Rate-Saturating Actuators," *Journal of Guidance, Control, and Dynamics*, Vol. 21, No. 3, May-June, 1998, pp. 361-367.

39.) Hess, R. A., and Stout, P. W., "Assessing Aircraft Susceptibility to Nonlinear Aircraft-Pilot Coupling/Pilot-Induced Oscillations," *Journal of Guidance, Control, and Dynamics*, Vol. 21, Nov.-Dec., 1998, No. 6, pp. 957-964.

California, Davis.

[7]Consultant, 19 Victoria Road, St. Annes, Lancaster, FY8, ILE, U.K.

40.) Chung, J. H.,[8] Velinsky, S. A.,[9] and Hess, R. A., "Interaction Control of a Redundant Mobile Manipulator," *The International Journal of Robotics Research*, Vol. 17, No. 12, Dec. 1998, pp. 1302-1310.

41.) Zeyada, Y. Hess, R. A., and Siwakosit, W., "Analysis of Aircraft Handling Qualities and Pilot-Induced Oscillation Tendencies with Actuator Saturation, *Journal of Guidance, Control, and Dynamics*, Vol. 22, No. 6, Nov.-Dec., 1999, pp. 852-861.

42.) Siwakosit, W., Snell, S. A., and Hess, R. A. "Robust Flight Control Design with Handling Qualities Constraints Using Scheduled Linear Dynamic Inversion and Loop-Shaping, *IEEE Transactions on Control Systems Technology*, Vol. 8, No. 3, May, 2000, pp. 483-494.

43.) Hess, R. A., Siwakosit, W. And Chung, J., "Accommodating a Class of Actuator Failures in Flight Control Systems," *Journal of Guidance, Control, and Dynamics*, Vol. 23, No. 3, May-June, 2000, pp. 412-419.

44.) Zeyada, Y., and Hess, R. A., "Modeling Human Pilot Cue Utilization with Applications to Simulator Fidelity Assessment," *Journal of Aircraft*, Vol. 37, no. 4, July-Aug., 2000, pp. 588-598.

45.) Schroeder, J. A., Chung, W. W. Y., and Hess, R. A., "Evaluation of Motion Fidelity Criterion with Visual Scene Changes, *Journal of Aircraft*, Vol. 37, No. 4, July-Aug., 2000, pp. 580-587.

46.) Hess, R. A., and Siwakosit, W., "Assessment of Flight Simulator Fidelity in Multiaxis Tasks Including Visual Cue Quality," Vol. 38, No. 4, July-Aug., 2001, pp. 607-614.

47.) Siwakosit, W., and Hess, R. A., "Multi-Input/Multi-Output Reconfigurable Flight Control Design, *Journal of Guidance, Control, and Dynamics*, Vol. 24, No. 6, Nov.-Dec., 2001, pp. 1079-1088.

48.) Hess, R. A. "Aircraft Dynamics and Control," in Wiley *Online Encyclopedia of Electrical and Electronics Engineering*, Ed: J. G. Webster, 2002.

498.) Hess, R. A., "Pilot Control," in *Principles and Practice of Aviation Psychology*, Erlbaum, Mahwah, NJ, Ed: P. S. Tang and M. A.Vidulich, 2002, Chap. 8.

50.) Hess, R. A., Zeyada, Y., and Heffley, R.K., "Modeling and Simulation for Helicopter Task Analysis, *Journal of The American Helicopter Society*, Vol., 47, No., 2, Oct., 2002, pp. 243-252.

---

[8]Graduate student of Prof. Velinsky

[9]Professor, Dept. of Mechanical and Aeronautical Engineering, University of California, Davis

51.) Zeyada, Y., and Hess, R. A., "Computer-Aided Assessment of Flight Simulator Fidelity," *Journal of Aircraft,* Vol., 40, No., 1, Jan-Feb., 2003, pp. 173-180.

52.) Hess, R. A., "Coupling Numerators and Input-Output Pairing in Square Control Systems, *Journal of Guidance, Control, and Dynamics,* Vol., 26, No. 2, March-April, 2003, pp. 367-368.

53.) Hess, R. A., and Wells, S. R., "Sliding Mode Control Applied to Reconfigurable Flight Control Systems," *Journal of Guidance, Control and Dynamics,* Vol. 26, No. 3, May-June 2003, pp., 452-463.

54.) Wells, R. S., and Hess, R. A., "Multi-Input, Multi-Output Sliding Mode Control for a Tailless Fighter Aircraft," *Journal of Guidance, Control and Dynamics,* Vol. 26, No. 3, May-June 2003, pp., 4673-473.

55.) Vetter, T. K., Wells, S. R., and Hess, R. A., "Designing for Damage, - Robust Flight Control Design Using Sliding Mode Techniques," *Proceedings of the Institution of Mechanical Engineers, Vol. 217, No. G5: Journal of Aerospace Engineering,* 2003, pp. 245-262.

56.) Hess, R. A., Vetter, T. K., and Wells, S. R., "Design and Evaluation of a Damage-Tolerant Flight Control System," *Proceedings of the Institution of Mechanical Engineers, Vol. 219, No. G4: Journal of Aerospace Engineering,* 2005, pp.341-360. (Published in Special Issue on Reconfigurable Flight Control Systems for which Prof. Hess served as Editor).

57.) Hess, R. A., "A Simplified and Approximate Technique for Scaling Rotorcraft Control Inputs for Turbulence Modeling," *Journal of the American Helicopter Society,* Vol. 49, No. 3, 2004, pp. 361-366.

58.) Hess, R. A., and Ussery, T. "Frequency-Domain Sliding Mode Design Technique Applied to the Control of a Ducted Fan Micro-Air Vehicle," *Journal of the American Helicopter Society,* Vol. 49, No. 4, 2004, pp. 457-467.

59.) Hess, R. A., "Rudder Control Strategies and Force/Feel System Designs in Transport Aircraft," *Journal of Guidance, Control and Dynamics,* Vol. 28, No. 6, Nov.- Dec., 2005, pp. 1251-1262.

60.) Hess, R. A., "Simplified Approach for Modelling Pilot Pursuit Control Behaviour in Multi-Loop Flight Control Tasks, *Proceedings of the Institution of Mechanical Engineers, Vol. 220, No. G2: Journal of Aerospace Engineering,* 2006, pp. 85-102.

61.) Hess, R. A., "Certification and Design Issues for Rudder Control Systems in Transport Aircraft," *Journal of Guidance, Control and Dynamics,* Vol. 29, No. 5, Sept.-Oct., 2006, pp. 1210-1220.

62.) Hess, R. A., "Simplified Technique for Modeling Piloted Rotorcraft Operation Near Ships," *Journal of Guidance, Control and Dynamics,* Vol. 29, No. 6, Nov.-Dec., 2006, pp. 1339-1349.

63.) Hess, R. A., and Cama, G., "Frequency Domain, Pseudo-Sliding Model Control System for a Flexible Aircraft," *Institution of Mechanical Engineers, Part G, Journal of Aerospace Engineering,* Vol. 221, No. G5, 2007, pp. 707-718.

64.) Hess, R. A., "Obtaining Multi-Loop Pursuit-Control Pilot Models from Computer Simulation," *Institution of Mechanical Engineers, Part G, Journal of Aerospace Engineering,* Vol. 222, No. G2, 2008, pp. 189-200.

65.) Hess, R. A., "Metrics for the Evaluation of Pedal Force/Feel Systems in Transport Aircraft," *Journal of Aircraft,* Vol. 45, No. 2, 2008, pp. 651-662.[10]

66.) Hess, R. A., and Bakhtiari-Nejad, M., "Sliding-Mode Control of a Nonlinear Unmanned Aerial Vehicle Model, *Journal of Guidance, Control, and Dynamics,* Vol. 31, No. 4, 2008, pp. 1163-1166.

67.) Hess, R. A., and Cama, G., "Flight Control System Design for Inherent Damage Tolerance," *Journal of Aircraft,* Vol. 45, No. 6, 2008, pp. 2024-2035.

68.) Hess, R. A., "Analytical Assessment of Performance, Handling Qualities, and Added Dynamics in Rotorcraft Flight Control," *IEEE Transactions on Systems, Man, and Cybernetics, Part A: Systems and Humans,* Vol. 39, No. 1, 2009.

69.) Hess, R. A., and Marchesi, F., "Analytical Assessment of Flight Simulator Fidelity Using Pilot Models," *Journal of Guidance, Control and Dynamics,* Vol. 32, No. 3, May-June, 2009, pp. 760-770.

70.) Hess, R A., "Candidate Structure for Modeling Pilot Control Behavior with Sudden Changes in Vehicle Dynamics," *Journal of Aircraft,* Vol. 46, No. 5, Sept.-Oct., 2009, pp. 1584-1592.

71.) Hess, R. A., "A Framework of Robust Rotorcraft Flight Control Design," *Journal of the American Helicopter Society,* 2010, in press.

72.) Hess, R. A., "Fixed-Wing Control and Handling Qualities," *Encyclopedia of Aerospace Engineering,* Vol. 5, Part 22, Chap. 225, Wiley, 2010, in press.

[10] This paper was also presented at the AIAA Aerospace Sciences Meeting, Jan. 2008. It received the best paper award for sessions devoted to Atmospheric Flight Mechanics.

Joshua N. Hohn, AICP

Associate Planner

Education

M.C.P., Land Use Planning, Department of City and Regional Planning – University of California, Berkeley, 2003
M.A., Information and Communication Studies – California State University, Chico, 1997
B.A., Public Administration – California State University, Chico, 1994

Professional Registrations

American Institute of Certified Planners (2006, Certified Planner No. 020889)

Distinguishing Qualifications

- Ten years of experience in land use and community planning.
- Experience in siting, licensing and permitting of renewable energy facilities in California on lands under local, state and federal jurisdiction.
- Expertise in visual impact analyses and issues related to aesthetic environment, particularly with siting and licensing of energy/utility facilities and infrastructure.
- Experience in the production of Solar Energy Plans of Development (POD), comprehensive planning documents used in the development of solar energy facilities on lands administered by the Bureau of Land Management (BLM).
- Experience in preparing California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) documents, including experience as Project Manager for Environmental Impact Reports (EIR).
- M.C.P. coursework focused on sustainability and sustainable land use planning, including concurrent research fellowship through the Sustainable Communities Leadership Program.

Relevant Experience

Mr. Hohn is a visual planner and conducts analyses of visual effects resulting from implementation of proposed projects while managing field visits, site photography, and tasks related to production of maps, photo-simulations, and other computer-generated graphics. As part of the Industrial Services Business Group, Mr. Hohn's visual planning work currently focuses on renewable energy projects (namely solar, wind and wave power projects) and more traditional gas-fired power plant and related transmission line projects and Applications for Certification. He has also conducted visual analyses related to general plan updates, water treatment facilities, federal dam relicensing applications, oil refinery plant expansions, residential developments and Bureau of Land Management Resource Management Plans.

As an associate planner, Mr. Hohn assists in project management and in the preparation of analyses, applications, and planning documents related to the siting and licensing of utility/energy facilities and infrastructure. Documents prepared include opportunities and

constraints reports, fatal flaws analyses, and comprehensive plans that serve as the primary focus of application and certification processes. These efforts are ongoing and in the service of confidential clients.

Representative Projects

Visual Impact Analyses

Visual Analyst, Mariposa Energy Project (Alameda County, CA), Mariposa Energy, LLC. Prepared the visual impact analysis of a power plant for California Energy Commission Application for Certification (AFC). Analyzed visual impacts and prepared the visual resources section.

Lead Visual Analyst, California High Speed Rail Project – Merced to Fresno Segment, California High Speed Rail Authority. Serve as lead analyst of potential impacts to visual resources from the proposed construction of the California High Speed Rail segment extending from Merced, CA to Fresno, CA. Conducted preliminary alternatives analysis and coordinated production of photo-simulations. Environmental Impact Statement section to serve as model for other project segments.

Lead Visual Analyst, Alta Wind Energy Center (Tehachapi, CA), Terra-Gen Power, LLC. Served as lead analyst of potential impacts resulting from programmatic development of new wind energy facilities within the Tehachapi Wind Resource Area in Kern County, CA. Specific projects include:

- **Alta East Wind Project**. Lead visual analyst for study of proposed 300-megawatt wind energy project (up to 120 wind turbine generators within an approximately 3,700-acres site). Project site is located in the eastern Tehachapis, west of Mojave, on private and federally-managed land. Analysis, including visual simulations, used in technical report prepared to accompany both Bureau of Land Management Plan of Development and County application, and to support County development of Environmental Impact Report.
- **Alta-Oak Creek Mojave Project**. Lead analyst for "shadow flicker" study of effects potentially resulting from proposed 600-800-megawatt project (up to 320 wind turbine generators within an approximately 9,300-acre site). Lead analyst of potential aesthetic effects resulting from construction of "infill" turbines for addendum to project Environmental Impact Report.

Visual Analyst, Wind Energy Facilities – Analyses and Photo-Simulations for Proposed Projects in California, Kansas and Wyoming, Led/supported analysis of potential visual impacts resulting from development of new wind energy facilities and the re-powering of existing wind resource areas. Specific projects include:

- **Altamont Wind Energy Repowering (Contra Costa County, CA), Confidential Client.** Lead production of visual simulations showing potential visual effects resulting from proposed wind energy facility near a sensitive recreational area. Coordinated production of viewshed analysis, indicating potential visibility of project based on location and site/regional topography.

- **Hays Wind Project (Ellis County, Kansas), Iberdrola Renewables.** Coordinated production of set of photo-simulations for a proposed wind farm facility. Working with a set of views provided by client, selected Key Observation Points (KOPs) based on analysis of potentially sensitive visual receptors. Final deliverable also included "view cone" figures, indicating on an aerial graphic which exact simulated objects would be visible in the simulated view.

- **Campbell Hill Wind Power Project (Converse County, Wyoming), Duke Energy.** Conducted field work and assisted in the analysis of potential aesthetic effects of a proposal to develop a 100-MW wind farm and 230-kV transmission line on ranch lands in the area north of Glenrock. This analysis became the Visual Resource chapter of the project's Environmental Assessment required by the Wyoming State Industrial Act permit process.

Visual Analyst, WaveConnect Pilot Project, Pacific Gas & Electric. Serving as lead analyst of visual effects resulting from proposed wave energy pilot project located along the northern California coast. Analysis included study of a range of wave energy converters (WEC), as potentially visible from a variety of coastal settings.

Primary Author, California Energy Commission (CEC) Applications for Certification (AFC) / AFC Amendments. Primary author of visual impact analyses for proposed new power plant facilities, power plant expansions, and the conversion of single-cycle power plants to combined-cycle facilities. Coordinated efforts with clients and CEC staff to structure approach, organized field visits, and oversaw the production of associated graphics, including photo-simulations. Identified potentially sensitive visual receptors and project-appropriate mitigation measures. Methodology employed in assessment for AFCs and AFC Amendments was consistent with CEQA requirements. Selected projects include:

- **GWF Tracy Combined Cycle Power Plant (Tracy, CA), GWF Energy LLC –** AFC seeking modification of the existing Tracy Peaker Plant from an existing nominal 169-megawatt (MW) simple-cycle power plant to a combined cycle power plant, resulting in an overall nominal net generating capacity of 314 MW.
- **Hanford Combined Cycle Power Plant (Hanford, CA) and Henrietta Combined Cycle Power Plant (Kings County, CA), GWF Energy LLC –** AFCs seeking amendments to convert existing 95-MW simple-cycle power plants into combined-cycle power plants each with a nominal net 25-MW of additional capacity.
- **Lodi Energy Center Power Project (Lodi, CA), Northern California Power Agency –** AFC seeking authority to construct and operate a natural gas-fired, combined-cycle electrical generating facility rated at a nominal generating capacity of 255 MW.
- **Mariposa Energy Project (Alameda County, CA), Mariposa Energy LLC –** AFC seeking authority to construct and operate a nominal 200-MW, simple-cycle generating facility. Also wrote AFC Land Use chapter.
- **Oakley Generating Station (Oakley, CA), Contra Costa Generating Station LLC –** AFC seeking authority to construct and operate a nominal 624-MW natural gas-fired, combined cycle electrical generating facility.

Visual Analyst, Transmission Line Reconductoring, Confidential Client. Documented visual changes likely to result from proposed reconductoring of an existing 230-kilovolt (kV)

transmission line. Coordinated field visit during which existing conditions were documented and KOP locations selected based on the presence of potentially sensitive visual receptors relative to the transmission line.

Siting and Licensing

Project Planner, Mariposa Energy Project (Alameda County, CA), Mariposa Energy, LLC. Prepared the land use analysis of a power plant for California Energy Commission (CEC) Application for Certification (AFC). Analyzed land use impacts, prepared the land use section, and responded to comments and questions from the CEC and counties surrounding the project site.

Deputy Project Manager, Concentrated Photovoltaic Solar Project, Confidential Client. Lead application process for County-issued permits for 40-megawatt concentrated photovoltaic solar project in a generally agricultural setting. Applications include General Plan Amendment, Re-Zone, Conditional Use Permit and Street Vacation. Facilitating federal environmental analysis required by project's reliance on Department of Energy funding.

Project Planner, Alta Oak Creek Wind Energy Project (Kern County, CA), Terra-Gen Power, LLC. Provide general support for the permitting of a wind energy project proposed to generate up to 800 megawatts of energy, with specific focus on Plan of Development for Bureau of Land Management and on visual impacts analyses.

Project Planner, Solar Siting Plan of Development, Confidential Client. Coordinated production of document detailing proposed 700-megawatt solar energy facility. Plan of Development was consistent with Bureau of Land Management format.

Project Planner, Opportunities and Constraints Analysis for Linear Transmission Project, Confidential Client. Conducted analysis of potential opportunities and constraints specific to utilities and transmission facilities proposed for a multi-state route. Analysis addressed federally managed lands.

Professional Organizations/Affiliations

American Planning Association, Northern California Chapter – Facilitator, Panel Presentation on Planning and Energy (2010)

Greenbelt Alliance – Member of Compact Development Team (2006 – 2008)

American Institute of Certified Planners – Certified Planner (2006)

Honors and Awards

2003 Outstanding M.C.P. Graduate – University of California at Berkeley, Department of City and Regional Planning

1997 College of Communication and Education Outstanding Teaching Associate – California State University, Chico

Jennifer Krenz-Ruark

Soils

Education

M.S., Soil Science – Purdue University; West Lafayette, IN
B.S., Natural Resources Management – University of Wisconsin-Stevens Point; Stevens Point, WI

Relevant Experience

Ms. Krenz-Ruark has 10 years of combined experience in soil science. Her experience ranges from academic to public and private positions. Her academic experience focused on soil and water sciences, with research on the physical properties and clay mineralogy of glacial landscapes in northwestern Indiana. Prior to joining CH2MHILL, Ms. Krenz-Ruark served as a soil scientist on the Spokane County Soil Survey (Spokane, WA) and project soil scientist for a private soil survey in southern Arkansas (Potlatch Corporation). Since joining CH2MHILL in 2006, Ms. Krenz-Ruark has worked on a wide range of projects, including field soil characterization, table top evaluations of soil properties, and evaluation of soil lab data. In addition, Ms. Krenz-Ruark has worked on soil and water management projects, including land application of municipal and food processing waste, nutrient management planning, preparation of monitoring reports to satisfy requirements of NPDES permits, and Environmental Impact Reports. Ms. Krenz-Ruark has worked on several energy projects, including preparation of Applications for Certification, determination of soil parameters for DESCPs, and development of restoration/revegetation plans.

Representative Projects

Mariposa Energy Project, Alameda County, California. Ms. Krenz-Ruark prepared the Soil Resources section of the Application for Certification for a simple-cycle generating facility with a nominal capacity of 200-megawatts.

Calpine Corporation, Fontana Energy Center. Ms. Krenz-Ruark prepared the Soil Resources section of the Application for Certification for a 100 MW power plant to be developed in the city of Fontana, California.

Calpine Corporation, Mesa Vista Power Station. Ms. Krenz-Ruark prepared the Soil Resources section of the Application for Certification for a simple cycle natural gas fired peaker power plant outside of Chula Vista, California.

GWF Energy, LLC; GWF Tracy Project. Ms. Krenz-Ruark prepared the Soil Resources section of the Application for Certification for a combined cycle power plant to be developed just outside the city of Tracy, California.

Turlock Irrigation District, Almond 2 Power Plant. Ms. Krenz-Ruark prepared the Soil Resources section of the Application for Certification for a 174 MW natural gas-fired combined cycle power plant to be developed in the city of Ceres, California.

Competitive Power Ventures, Incorporated; Vacaville Power Station. Ms. Krenz-Ruark prepared the Soil Resources section of the Application for Certification for a combined-cycle power plant with approximately 500 MW of nominal net generating capacity to be developed near the city of Vacaville, California.

SolarReserve, Rice Solar Energy Project. Ms. Krenz-Ruark assisted with the preparation of the Soil Resources section of the Application for Certification for this solar energy project proposed for development in eastern Riverside County, California.

US Army, Fort Irwin Military Reservation Retention Pond Design, Fort Irwin, California. Conducted soil survey investigation to determine suitability of soils within areas targeted for possible use for retention basins.

California Rice Commission (CRC), Rice Water Quality Program. Ms. Krenz-Ruark Assists with the preparation of the CRC's annual report to the Central Valley Regional Water Quality Control Board (CVRQCB). She is the lead author for the annual submittal to the CVRWQCB for compliance with the requirements of the *Conditional Waiver of Waste Discharge Requirements for Irrigated Agriculture (CWFR).* In addition, Ms. Krenz-Ruark serves as the QA/QC officer for the program, and is responsible for ensuring that all field and laboratory data meets WQCB standards.

Bureau of Indian Affairs (BIA) Blackfeet Reservation Water Litigation Project - Supplemental Land Classification, Blackfeet Indian Reservation, MT. Ms. Krenz-Ruark was the Field Lead for a project classifying soils on more than 5,000 acres of land on the Blackfeet Indian Reservation for arability and irrigability. She participated in field site determination, writing soil profile descriptions, map unit delineation, and assisted with the evaluation of landscapes for possible future irrigation.

Bureau of Indian Affairs (BIA) Blackfeet Reservation Water Litigation Project - Stock Water Pond Quantification, Blackfeet Indian Reservation, MT. Ms. Krenz-Ruark was the field lead for effort to quantify and delineate over 1200 stock ponds across the 1.5 million acre Blackfeet Reservation. Coordinated with subcontractors to gain access to Indian and Non-Indian owned lands. Participated in field determination and delineation of stock watering ponds and tanks, and coordinated interoffice GIS and GPS support. Prepared summary technical memo quantifying volume of water utilized for stock watering on the Blackfeet Reservation. This value will be part of the overall water right adjudication for the Reservation.

Thomas A. Lae, PG

Geologic Hazards and Resources

Education

Bachelor of Science – Geology. California State University, Fullerton

Professional Registrations

State of California Professional Geologist, License No. 7099

Relevant Experience

Mr. Lae has more than 20 years of experience in environmental geology and project management and is a California Professional Geologist. Mr. Lae serves as a project or task manager on numerous projects for a variety of private, federal and municipal clients and has an extensive background in environmental field investigations. Projects include: Section preparer for over 20 power plant licensing projects: Superfund site investigation oversight: remedial investigations/feasibility studies: underground storage tank/oil water separator closures: landfill groundwater monitoring: phase II environmental assessments: among others.

Representative Projects

Electrical Power Plant Application for Certification section preparer. Mr. Lae has prepared Geologic Hazards and Resources sections for 24 AFCs. These include the Mariposa Energy Project (Mariposa Energy, LLC), Almond 2 Power Plant (Turlock Irrigation District), East Altamont Energy Center (Calpine), Central Valley Energy Center (Calpine), Los Esteros Energy Center (Calpine), Cosumnes Power Plant (SMUD), Woodland II (Modesto Irrigation District), Modesto Electric Generation Station (Modesto Irrigation District), Walnut Energy Center (Turlock Irrigation District), San Francisco Electrical Reliability Project (San Francisco Public Utilities Commission), Highgrove (AES Pacific),Walnut Creek Energy Project (Edison Mission Energy), Sun Valley Energy Project (Edison Mission Energy), Eastshore Energy Project (Tierra), South Bay Energy Facility (Duke), Chevron Richmond Power Plant Replacement Project SPPE, Ivanpah Solar Electric Generating System (Bright Source Energy), Carlsbad Energy Center Project (NRG), Tracy Power Plant (GWF), Vacaville Energy Center (Competitive Power Ventures), Fontana Energy Center (Calpine) Lodi Energy Center (NCPA), and Oakley Generating Station (Radback). Mr. Lae is well versed in the assessment of geologic resources and hazards relating to CEQA and NEPA requirements.

California Energy Commission Hazardous Waste Remediation Oversight. A part of the PG&E's Gateway Generating Station (Antioch, CA) and Colusa Generation Station (Colusa, CA) construction, Mr. Lae served as the project's on-call Professional Geologist. His duties included the coordination of sampling, characterization, and remediation of hazardous waste materials (including asbestos, PCBs, and TPH) encountered during plant excavation activities. Mr. Lae provided a summary report upon completion of remedial activities for submittal to the CEC.

Superfund Site Investigation and Oversight. CH2M HILL provides support to the USEPA for a number of task orders, with Mr. Lae serving as project manager. At a former gold mine site in Nevada City impacted by past mining operations, three task orders include the O&M of a remedial action, conducting pilot treatment plant testing, and preparing a feasibility study. At a rocket engine test facility impacted by solvent, fuel, propellant, and metals contamination, two oversight task orders involve the review and comment of reports, white papers, technical memoranda, and studies that are submitted for regulatory review.

Union Pacific Railroad. Mr. Lae served as the project manager for several UPRR projects that included: a groundwater and soil TPH investigation at a former UST site (Donner Summit UST); an arsenic in soil assessment at a Right of Way (Clyde, CA), a TPH in soil site at Right of Way (Chico, CA), and nitrogen contamination in onsite soils (Willows, CA). Mr. Lae successfully received regulatory closure at all for of this project sites.

Remedial Investigation. For AFCEE, Mr. Lae serves as the project manager for the RI of the Beale AFB Clinic site. This site has been impacted by past release of TPH- and VOC-related contaminants. This project includes the removal of two 8,000-gallon diesel USTs as well as drilling, sampling, and well construction for contaminant delineation. The site lies between two former ranges – potentially impacted by UXO.

Groundwater Monitoring. For the City of Roseville, CA, Mr. Lae serves as the supervising geologist for the Annual and Semi-Annual groundwater reports for the former sanitary landfill. Duties included planning sampling events, evaluation of laboratory data, preparation of graphics and tabular data, and report writing. Mr. Lae also supports landfill gas studies at the site.

Groundwater Study/Well Decommissioning. Mr. Lae served as the project manager for TO 467 at Beale AFB. This project involved the installation of groundwater monitoring wells and the collection of groundwater samples to assess the effects of potential impact to the underlying groundwater from a retention pond that receives treated waste water. In addition, this project required the destruction of several former water/agricultural supply wells at the base per County and State destruction protocol.

Soil Vapor Extraction System Termination. Mr. Lae served as the project manager for the IC27 STOP project at the former McClellan AFB. This project involved the collection of soil gas samples and the preparation of report documentation to support the SVE system termination (closure). The project successfully met regulatory criteria and system termination was granted. The project also required the decommissioning of the system wells and conveyance pipelines.

Superfund Site Investigations. Mr. Lae served as a project (site) manager for the Cooper Drum superfund site, located in Southgate, CA. This project involved the evaluation and remedial investigation of soil and groundwater contamination from past releases at a drum recycling center.

Oil /Water Separator Closure Investigation. Mr. Lae served as the project manager for three projects at Beale AFB in the evaluation for regulatory closure of 25 former oil/water separators across Beale. The project included the assessment of environmental impacts to underlying soil and groundwater from past releases and preparing closure documentation. Mr. Lae has successfully received closure of 23 OWSs. Two OWSs are undergoing biovent remediation prior to closure.

UST and Oil Water Separator Investigation. Mr. Lae served as the project manager for three U.S. Navy project sites at Rough and Ready Island, Stockton, CA. These projects involved the evaluation of soil and groundwater contamination at sites with underground storage tanks or oil water separators. Soil and groundwater samples were collected and analyzed to determinethe presence or absence of contamination. Each of the three sites was successfully evaluated and a determination of "No Further Assessment" was received by the RWQCB.

Phase II Environmental Assessment. As a project manager, Mr. Lae conducted a Phase II environmental assessment for the City of Roseville at a former tire fire site with lead contamination. Duties included the work plan preparation, conducting field work, data review and report preparation.

Remedial Investigations. Mr. Lae served as a task manager/team member for several on-going investigations at both Beale AFB and former McClellan AFB, CA. Duties included site supervision of both junior and subcontractor staff, site management, and report writing. Report writing duties included review of field and laboratory data; determining nature and extent of contamination; developing graphic aids to illustrate contaminant distributions; identifying data gaps; presenting findings to upper management and clients; creating field sampling plans; and performing third-party document review, among other tasks.

Phase 3 Removal Action, Castle Airport, Merced, CA. Field supervisor of three crews during installation of 18 injection, extraction, and monitoring wells drilled with air rotary casing hammer and mud rotary drilling methods. Duties included preparing schedules, implementing overall project field sampling plans, supervising field staff, reviewing boring logs, overseeing subcontractors, assuring quality compliance of staff and subcontractors, designing wells, interpreting downhole geophysical logs, conducting well development, serving as laboratory and client project contact, compiling daily and monthly status reports, and tracking budgets.

Groundwater Well Installation, Castle Airport, Merced, CA. Field supervisor for installation of deep groundwater wells to monitor removal action at Castle Airport. The monitoring wells were drilled using mud-rotary drilling equipment, and designs were based on downhole geophysical surveys. Duties included overseeing subcontractor, logging subsurface geologic data, collecting and interpreting in-situ groundwater samples, interpreting geophysical surveys, and designing and developing wells.

Field Work, McClellan AFB and Castle AFB, CA. As staff geologist, duties included providing site reconnaissance and placement of boring/sampling locations; supervising subcontractors; enforcing project quality assurance plan; logging lithologic samples; collecting soil, soil gas, and groundwater samples; ensuring health and safety plan compliance of subcontractors; training new field staff on established protocols; generating daily progress reports; tracking waste containers; assisting in the placement, design, and construction of soil vapor extraction, nested soil vapor monitoring, and groundwater extraction wells; conducting subsequent step, drawdown, and long-term pumping well tests for groundwater wells; and performing SVE tests.

Project Geology Tasks, Various Clients and Locations. Conducted Phase I and Phase II environmental assessments and remedial investigations. Duties included regulatory agency contact, site reconnaissance, historical aerial photograph and map review, report preparation, development of Phase II work plans, preparation of health and safety plans, work plan

implementation, data collection and interpretation, and final report preparation. Also provided groundwater well design and installation, including placement of bore locations, soil sampling, logging of drill cuttings, monitor well casing design, groundwater sample collection, conducting slug tests, and report preparation. Provided construction observation of municipal-supply wells for numerous cities and agencies throughout Orange County. Duties included oversight of subcontractors, lithologic collection and description, sieve analyses, geophysical log interpretation, assistance with casing design, well development, test-pump and data collection and interpretation, and report preparations. Performed underground storage tank assessments/removals, including subcontractor coordination, initiating permit acquisitions, soil sampling, and report preparations.

CHEVALIER, ALLEN & LICHMAN LLP
Aviation, Environmental, Land Use and Commercial Law and Litigation

BARBARA E. LICHMAN, Ph.D.

ATTORNEY AT LAW

Professional Experience

Dr. Barbara E. Lichman is Managing Partner of Chevalier, Allen & Lichman, LLP, a firm specializing in airport development law and associated environmental and land use law, including Federal Aviation Regulations (FAR) governing grant funding and noise compatibility, the National Environmental Policy Act (NEPA), the Clean Air Act (CAA), the Clean Water Act (CWA), the California Environmental Quality Act (CEQA), the California Coastal Act, and the California Airport Land Use Planning statute. Dr. Lichman has also successfully represented clients on aviation related issues including airport access, air crash liability, and inverse condemnation.

Dr. Lichman's experience is both national and international. As a Registered Federal Lobbyist, Dr. Lichman successfully lobbied and testified before Congress on behalf of aircraft owners and operators on issues including the grant of investment tax credits for noise reduction of aircraft engines. She also served as counsel to Air AAA Group, a consortium of international architectural, engineering and construction companies in their airport development activities at the new Pudong Airport, Shanghai, China.

Among Dr. Lichman's current representative clients are both governmental and corporate entities. They include:

- City of Inglewood (CA), City of Culver City (CA), and County of Los Angeles (CA) (in challenges under State and Federal environmental statutes to the City of Los Angeles' plans for expansion of Los Angeles International Airport)

- City of Ontario (CA) (in the transfer of Ontario International Airport, currently operated by Los Angeles World Airports, to the City of Ontario and County of San Bernardino)

- Tinicum Township (PA) (in challenge to the Record of Decision for the Capacity Enhancement Project at Philadelphia International Airport)

- City of Mukilteo (WA) (in developing strategies for challenge to the potential expansion at Paine Field, Everett, Washington to accommodate commercial aircraft operations)

- Delaware County (PA) (in challenges to the Federal Aviation Administration's New York/New Jersey/Philadelphia Airspace Redesign, and the implementation of a Presumed to Conform Rule, effectively exempting Air Traffic Control procedures from compliance with the Clean Air Act)

- Diamond Generating Corporation (CA) (in approval process at California Energy Commission for "peaker" power facility in Alameda County, CA)

- M-TO Construction (CA) (in approval process at the Riverside County, CA Airport Land Use Commission for a 100 acre mixed use development proximate to Bermuda Dunes Airport in Indio, CA)

- Energize Vermont (VT) (in developing proposed legislation concerning land use planning in airport environs within the State of Vermont)

- Talbot Rivers Protection Association (MD) (in challenge to expansion of Easton/Newnam Field Airport in Easton, MD)

- The Surland Companies (CA) (in challenge to San Joaquin County (CA) Airport Land Use Compatibility Plan and its effect on land use surrounding Tracy Municipal Airport, Tracy, California, owned and operated by the City of Tracy)

Prior to her tenure as Managing Partner of Chevalier, Allen & Lichman, LLP, Dr. Lichman was an associate in the litigation department of McKittrick, Jackson, DeMarco & Peckenpaugh where she represented a broad array of corporate clients in contract and associated civil litigation.

Affiliations and Court Admissions

Dr. Lichman served on the Board of the Airport Consultants Council in 1996 and 1997, in which organization she remains an active member. She is also a member of the Lambda Alpha-Real Estate Honorary Society and the Orange County Bar Association Aviation Law Section. Dr. Lichman is the author of such articles as "Streamlining Environmental Review: Myth or Reality?," The Air and Space Lawyer, American Bar Association, Vol. 15, No. 3, Winter, 2001 dealing with issues arising in airport development litigation. A Member of the State Bar of California, Dr. Lichman is also admitted to practice in the U.S. District Courts for the Central and Southern Districts of California, the Third, Sixth and Ninth Circuit Courts of Appeals and the Court of Appeals for the District of Columbia Circuit.

Education

Dr. Lichman earned a Bachelor of Arts Degree from Brandeis University in 1967, a Masters of Planning from the University of Southern California School of Urban and Regional Planning in 1981, and a Doctorate of Philosophy in Urban and Regional Planning from the University of Southern California School of Urban and Regional Planning in 1986. In 1988, Dr. Lichman earned her law degree (Juris Doctor) from the University of Southern California Law Center.

ADOLPH MARTINELLI

Mr. Martinelli has over 40 years experience in land use regulation, environmental law, community design, housing, urban growth management and real estate development. Since July, 2003, Mr. Martinelli has been an independent land use consultant providing site assessment, development and permitting services to a variety of land-owners, developers and governmental agencies.

Mr. Martinelli served as Director of Alameda County's Community Development Agency from 1996 to July, 2003. During this period he also held the positions of Manager, Surplus Property Authority of Alameda County and Executive Director of the Alameda County Redevelopment Agency. Prior to his appointment as director, he served as Planning Director for Alameda County from 1990 to 1996 and as Assistant Planning Director in charge of Development Planning and Permitting from 1984 to 1996. Mr. Martinelli held positions at every level of the Planning Department during the period commencing in 1964.

As Community Development Director, he expanded and restructured the department into a multi-faceted community development organization which, in addition to traditional land use planning and regulation, included financing, project administration and construction management for housing and redevelopment programs; abandoned vehicle abatement; neighborhood preservation; childhood lead poisoning prevention; development of Alameda county’s underutilized real estate assets; and responsibility for the office of the Agriculture Commissioner and Weights and Measures.

Mr. Martinelli has directed the entitlement process, served as chief technical authority and set policy for numerous large scale residential and commercial development projects in southern and eastern Alameda County. He has presided over the completion and implementation of the comprehensive East County General Plan and other targeted area and specific plans to develop solutions to regional issues of economic development, jobs-housing balance, circulation, natural resource utilization, stabilization and turn-around of blighted areas and preservation and enhancement of key agricultural areas.

As Manager of the Surplus Property Authority, Mr. Martinelli directed an aggressive program to maximize value of Alameda County's real estate assets including formulating strategic plans, specific plans and design guidelines, completing the entitlement process in cities, and marketing to the private development community. Over twenty-five private developments have been built or are underway on former county owned land representing nearly three billion dollars in value. 2,600 homes and 2.5 million square feet of commercial and office space have been constructed since 1995. The program has netted Alameda County nearly $285,000,000 to date.

Awards received by the Alameda County Community Development Agency under his leadership include the **Outstanding Planning Award** for the South Livermore Valley Area Plan, Northern Section American Planning Association; **Partners in Building Award** from the Eastern Division of the BIA of Northern California; the **Ahwahnee Community Design Award** for the Ashland-Cherryland Business Districts Specific Plan from the Local Government Commission, and several nationwide **Best Practices Awards** from HUD.

Mr. Martinelli received a degree in Landscape Architecture from UC Berkeley in 1965.

Keith McGregor

Education

M.S., Atmospheric Science
B.S., Meteorology

Distinguishing Qualifications

- Experience preparing natural gas fired power plant siting and licensing materials for submittal to the California Energy Commission and local regulatory agencies.
- Experience preparing permit conditions based on engineering design and dispersion modeling analyses.
- Completion of human health risk assessments for stationary and mobile sources consistent with OEHHA and ARB guidelines.
- Preparation of numerous air quality technical reports and air quality sections consistent with NEPA and CEQA requirements.
- Experience in developing and managing ambient air monitoring programs

Relevant Experience

Mr. McGregor has more than 10 years of general air quality and project management experience. His project experience includes dispersion modeling, meteorological and air quality data analysis, new project review and permitting, human health risk assessments, and emission inventories. Mr. McGregor is experienced with the assessment of potential air quality impacts and permitting activities for numerous industrial facilities, including power plants, food manufacturing, wastewater treatment plants, and federal defense facilities. His CEQA experience includes air quality assessments for airports, marine ports, freeways, transit alternatives, railyard terminals, and truck expressways.

Representative Projects

Mariposa Energy, Mariposa Energy Project; CEC Application for Certification, Byron, California. Responsible for the preparation of the air quality and public health sections of the AFC for the natural gas fired simple cycle peaking facility. Tasks included the preparation of the dispersion modeling protocol and permit application materials for the Bay Area Air Quality Management District (BAAQMD), assessment of stationary combustion source emissions from the proposed project, coordination and review of the air dispersion modeling effort, comparison of results to New Source Review (NSR) and BAAQMD thresholds, evaluation of BAAQMD and CEC CEQA mitigation requirements, evaluation of the potential human health risks associated with the project, and responses to comments received on the air quality and public health documents.

Radback Energy; Oakley Generating Station; CEC Application for Certification, Oakley, California. Serving as the Deputy Project Manager for the OGS project, a natural gas fired combined cycle base load facility. Tasks completed to date include supporting the project manager as needed, working with project staff on a day-to-day basis to track the progress of the AFC sections and other permit-related deliverables, assisting staff in obtaining

information necessary for the AFC, working with document design specialist to make certain that final editing, document production, and printing were completed on schedule. Responsible for assisting with the preparation of the Drainage, Erosion, and Sediment Control Plan and the Planning Survey Report, which was submitted to the East Contra Costa County Habitat Conservancy.

Solar Reserve; Rice Solar Energy Project; CEC Application for Certification; Rice, California. Responsible for managing the preparation of the air quality and public health sections of the AFC for a concentrating solar power project. Tasks included the preparation of the dispersion modeling protocol for the Mojave Desert Air Quality Management District (MDAQMD), assessment of stationary combustion source emissions from the construction and operation of the proposed project, coordination and review of the air dispersion modeling effort, comparison of results to NSR and MDAQMD thresholds, and preparation of the air quality and public health sections and responses to public comments received during the CEC licensing process.

GWF; GWF Tracy Combined Cycle Power Plant Project; CEC Application for Certification; Tracy, California. Responsible for the preparation of the air quality and public health sections of the AFC for a natural gas fired combined cycle facility. Tasks included the preparation of the dispersion modeling protocol for the San Joaquin Air Pollution Control District (SJVAPCD), assessment of stationary combustion source emissions from the proposed project, coordination and review of the air dispersion modeling effort, comparison of results to NSR, PSD, and SJVAPCD thresholds, and preparation of the air quality and public health documents.

City of Vernon; Vernon Power Plant; CEC Application for Certification; Vernon, California. Responsible for managing the preparation of the air quality and public health sections of the AFC for a natural gas-fired combined cycle power plant. Tasks included the preparation of the dispersion modeling protocol for the South Coast Air Quality Management District (SCAQMD), assessment of stationary combustion source emissions from the proposed project, coordination and review of the air dispersion modeling effort, comparison of results to NSR, PSD, and SCAQMD thresholds, and preparation of the air quality and public health documents.

AES Highgrove; AES Highgrove Power Plant; CEC Application for Certification; Grand Terrace, California. Responsible for the preparation of the air quality section of the AFC for a natural gas fired simple cycle peaking facility. Tasks included the preparation of a protocol for evaluating the air quality impacts for a new source in the South Coast Air Quality Management District (SCAQMD), assessment of stationary combustion source emissions from the proposed project, coordination and review of the air dispersion modeling effort, comparison of results to applicable NSR and SCAQMD thresholds, and preparation of the air quality text and appendices.

Chevron; Chevron Power Plant Replacement Project; CEC Small Power Plant Permit Application; San Francisco, California. Responsible for the air quality section of the SPPE application. Tasks include the assessment of stationary combustion source emissions from a proposed project within the Bay Area Air Quality Management District (BAAQMD), coordination and review of the air dispersion modeling effort, comparison of results to

applicable NSR, PSD, and BAAQMD thresholds, and preparation of the air quality text and appendices.

Port of Long Beach – EIR for Confidential Tenant, Long Beach, California. Responsible for managing the preparation of the CEQA documentation required for the air quality and public health assessments. Task included the evaluation of impacts from the existing and future operations including ocean going vessels, harbor vessels, heavy duty trucks, support equipment, and storage tanks.

Los Angeles Department of Water and Power; Owens Lake Dust Mitigation Program; Keeler, California. Assistant task manager for the air monitoring program which consisted of over 40 sampling locations with approximately 130 particulate and meteorological monitoring instruments. Responsibilities included the preparation of the quality assurance plan, procurement and installation of the monitoring network, data management and quality control, and lead auditor for the quarterly and semi-annual audits.

Department of Water Resources; Salton Sea Ecosystem Restoration Project; Imperial, California. Supported the development and implementation of an expanded air quality monitoring program in the Salton Sea Air Basin. Tasks included assisting with the preparation of the preliminary network design, coordination of the monitoring site selection process, assistance with the preparation of the 5-year plan and the monitoring and assessment plan (MAP) documents, and participation in technical working group meetings for air quality and data management activities.

CURRICULUM VITAE

Douglas M. Moss
AeroPacific Consulting
3858 Carson St, Suite 120
Torrance, CA 90503
310-503-4350
Doug.Moss@aeropacific.net

PROFESSIONAL AVIATION EXPERIENCE

May 2009 - Present

UNIVERSITY OF SOUTHERN CALIFORNIA

Faculty Instructor: USC Viterbi School of Engineering - Aviation Safety and Security Program
Teach fundamentals of Human Factors as they relate to aircraft design, pilot and crew performance, and flight operations.

Jul 1997 - Present

UNITED AIRLINES

Pilot – Airbus A320
Pilot on the Airbus A320 flying to both domestic and international destinations.

Flight Engineer and Line Check Airman (Instructor) – Boeing B-727
Performed flight engineer duties as well as instructed and supervised new flight engineers on operational skills coming out of initial training.

Flight Operations Technical Steering Committee member - Contributed to technological advances and implementation programs for the entire fleet of aircraft at United Airlines.

Mar 1990 - Jul 1997

DOUGLAS AIRCRAFT COMPANY

Senior Experimental Test Pilot - DC-9, MD-80, MD-90, and MD-11 Flight Test Programs
Conducted developmental flight testing of all Douglas Aircraft Company products. Testing included all facets of aircraft certification, such as performance, flying qualities, structural aerodynamic damping, braking performance, stall & high angle-of-attack, engine-out takeoff performance, noise certification, simulator development and certification, etc. Evaluated prospective aircraft designs for operational, engineering, and humans factors considerations.

Technical and Operational Representative -
Provided on-site support to various airlines to solve operational and engineering issues concerning the MD-80/90. Spent approximately 6 months in China in direct support of China Northern Airlines' operational issues of the MD-80 and entry into service of the MD-90. Other airlines supported were Delta, ValueJet, and China Eastern Airlines.

Fleet Manager - MD-95 (B-717)
Directly responsible for the flight crew certification and training programs for the MD-95 (B-717)

MD-80/90 Instructor Pilot and Line-Check Airman -
Provided simulator, flight, and operational line instruction in the MD-80/90 to pilots of customer airlines such as China Northern, UNI Air, Uland, Great China, and EVA Airlines.

Aerial Demonstration Pilot – MD-90 –
Performed aerial demonstrations of the MD-90 at the China International Aviation & Aerospace Exhibition in 1996 in Zuhai, China.

Chief photo/safety chase pilot - T-33, KingAir, and Lear 25/35
Responsible for all photo and safety chase requirements for Douglas Aircraft Company. Flew T-33, Kingair, and Lear 25/35. Developed and implemented a training program to upgrade other Douglas Aircraft Company pilots to perform safety/photo chase.

Mar 1990 - Sep 2000

US AIR FORCE (RESERVES)

USAF Test Pilot School (TPS)

Reserve Advisor to the Commandant - USAF Test Pilot School

Directly responsible to TPS Commandant for the performance of 16 other USAF Reserve officers (engineering and flight instructors).

Instructor Test Pilot and Academic Instructor - A-37, T-38

Instructed TPS students in all phases of the curriculum in the A-37 and T-38. Flight instruction included performance, flying qualities, weapons delivery, human factors evaluation, and systems evaluation.

Jun 1977 - Mar 1990

US AIR FORCE (ACTIVE DUTY)

USAF Test Pilot School (TPS)

Instructor Test Pilot and Academic Instructor - F-4, A-37, T-33

Instructed TPS students in all phases of the curriculum in the F-4, A-37, and T-38. Flight instruction included performance, flying qualities, weapons delivery, human factors evaluation, and systems evaluation.

Chief, Flying Qualities Branch -

Responsible for the development and instruction of the Flying Qualities syllabus for both flight and academic instruction.

Chief Spin pilot -

Responsible for the academic and flight instruction of the High-Angle-of-Attack, Stall, and Spin training program at TPS.

USAF Flight Test Center

Project Test Pilot - T-46 Flight Test Program

Conducted all aspects of developmental flight testing for the T-46 Next Generation Trainer, such as performance, flying qualities, systems evaluation, and operational assessment.

Project Test Pilot - F-4 AIM/ACES Flight Test Program

Conducted testing of the AIM/ACES parachute extraction system on the F-4.

Project Manager – F-22 Advanced Tactical Fighter

Primary point of contact and manager for the Edwards AFB support preparation plan for the F-22 Advanced Tactical Fighter.

18th Tactical Fighter Wing –

F-15 Pilot

Operational fighter pilot stationed at Kadena Air Base, Japan. Deployment locations included Korea and the Philippines.

71st Flying Training Wing –

T-37 Instructor Pilot

Provided initial pilot training to student pilots. Flight instruction encompassed both simulators and aircraft. Missions included basic airmanship, instruments, cross-country, and formation flying.

ACADEMIC EDUCATION

May 2008 **Juris Doctor (J.D.), cum laud**
Concord Law School, Los Angeles

May 2007 **Aviation Safety and Security Certificate**
University of Southern California, Los Angeles, CA

Apr 1994 **Master of Business Administration (M.B.A.)**
University of Phoenix, Phoenix, AZ

Mar 1981 **Master of Science in Mechanical Engineering (M.S.M.E)**
Georgia Institute of Technology, Atlanta. GA

Jun 1976 **Bachelor of Nuclear Engineering (B.N.E)**
Georgia Institute of Technology, Atlanta, GA

AVIATION SCHOOLS ATTENDED

Nov 1999 A320 Qualification
United Air Lines

Oct 1997 B-727 Flight Engineer Qualification
United Air Lines

Jul 1995 MD-11 Type Rating
Douglas Aircraft Company

Jul 1990 DC-9/MD-80 Type rating
Douglas Aircraft Company

Jun 1990 Air Transport Pilot Ground School
Santa Ana, CA

Sep 1986 T-33 Qualification
Tyndall AFB, FL

Sep 1985 F-4 Qualification
McConnell AFB, KS

June 1985 Experimental Test Pilot Training
USAF Test Pilot School

Mar 1982 F-15 Qualification
Luke AFB, AZ

Sep 1978 Instructor Pilot Qualification
Randolph AFB, TX

June 1977 Undergraduate Pilot Training
Vance AFB, OK

FAA CERTIFICATES & RATINGS

ATP - Airline Transport Pilot Certificate – Airplane, Multi-Engine Land
Commercial Privileges – Airplane Single Engine Land and Sea, Multi Engine
FE - Flight Engineer – Turbojet
Type Ratings – DC-9/MD-80/MD-90, MD-11, A320
Current Qualification – A320

AIRCRAFT QUALIFICATIONS

Military		Commercial		General Aviation	
F-4 C/D/E	T-34B	DC-9	A319/320	C-152/172/182	Beech BE35
RF-4	T-37	MD-80	B-727	Grumman AA5	Piper PA28
F-15	T-38	MD-90		Beech BE23	Piper PA34
A-37	T-46	MD-11		Beech BE34	Piper PA38
T-33					

AIRCRAFT FLOWN

Airbus – A319/320
Beechcraft – Musketeer, Sundowner, Bonanza, Kingair
Cessna Aircraft – 150, 152, 172, 182 T-37, A-37, O-2
Convair – F-106
DeHavilland – U-1 Otter, UV-18 Twin-Otter
Douglas – DC-9, MD-80, MD-90, MD-11
Fairchild – T-46
Gliders –
- Blanik L-23
- Grob 102

Grumman American – AA5 Tiger
Helicopters
- Aerospatiale Gazelle SA341
- Bell – H-1

Lear – L25, L35
Lockheed – F-16, F-104, C-130, C-141, P-3, S-3
McDonnell – F-4, F-15
Piper – Tomahawk, Cherokee, Seneca
Vought – A-7

FLIGHT TIMES (as of Jul 2010)

TOTAL **11,900**

Pilot in Command	4,557	Multiengine	9,534	Actual Instruments	912
Instructor Pilot	1,387	Single Engine	487	Simulated Instruments	361
Second-in-Command	4,820	Cross Country	6,224	Simulator	1,184
Flight Engineer	1,145	Turbine	9,644	Night	2,560

CONFERENCE PRESENTATIONS

"Common Errors in Cockpit Design, Displays, and Controls." Society of Automotive Engineers: World Aviation Conference & Exposition., Anaheim, CA. Sep 1998.

"MD-90 Developmental Flight Test." various civic and aviation groups in the Los Angeles area. Dec 1996.

"MD-80 Engine Anomalies and Autothrottle Operations." Douglas Aircraft Company Twin-Jet Conference., Long Beach, CA. 1995.

MISCELLANEOUS EDUCATION

Air War College, 1999, military-political affairs, Maxwell AFB, AL
Air Command and Staff College, 1985, staff training, Maxwell AFB, AL
Squadron Officer School, 1981, leadership training, Maxwell AFB, AL

PROFESSIONAL & TECHNICAL PUBLICATIONS / RESEARCH

"Evaluation of Flight Operations at ValuJet Airlines." Douglas Aircraft Company Operational Report., Feb 1996.

"Evaluation of Flight Operations at China Northern Airlines." Douglas Aircraft Company Operational Report., Dec 1995.

"A Pilot's Perspective – Flight Testing the MD-90." Douglas Service Magazine, Volume 49, Second Issue, 1994:2-7.

"MD-80 Autothrottle Speed Control System." Douglas Service Magazine, Volume 49, First Issue, 1994: 16-19.

"Engine Malfunctions on Takeoff." Douglas Service Magazine, Volume 48, First Issue, 1993: 14-17

"MD-80 & MD-90 High Altitude Performance Characteristics", Douglas Service Magazine, Publication pending.

Alan Reed, Douglas Moss, et al. "Evaluation of Lateral Handling Qualities as a Function of Roll Mode Time Constant and Time Delay, Measured by Handling Qualities During Tracking (HQDT) Exercises." USAF Test Pilot School Research Project, June 1985.

"Energy Cost Analysis of the Proposed Combined 8th and 25th Squadron Operations Center", 71st Civil Engineering Squadron, Vance AFB, OK, Apr 1981.

"Space Flight – Transfer Orbits and their Optimization", Dept of Mathematics, Oklahoma State University, Stillwater, OK, Feb 1981.

"Waterhammer in Closed Piping Systems - Its Intensity vs Valve Closure Rates", Dept of Mechanical Engineering, Oklahoma State University, Stillwater, OK. Dec 1980.

"Derivation of Dip and Azimuth Angles from Dipmeter Correlograms", Dept of Mathematics, Oklahoma State University, Stillwater, OK, Sep 1980.

"Effects of Heat Transfer on the Performance of a Diesel Engine", Graduate Archives, Dept of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA, Feb 1980.

"Heat Transfer Effects from the Free Convection of Helium Gas in Irradiated Nuclear Fuel Rods", Graduate Archives, Dept of Nuclear Engineering, Georgia Institute of Technology, Atlanta, GA, Dec 1979

PROFESSIONAL MEMBERSHIPS

Society of Experimental Test Pilots (SETP)
Air Line Pilots Association (ALPA)
Experimental Aircraft Association (EAA)
Association for Aviation Psychology (AAP)
California Bar Association
Society of Automotive Engineers - SAE International (SAE)
Aircraft Owners and Pilots Association (AOPA)
American Institute of Aeronautics and Astronautics (AIAA)
American Bar Association (ABA)
Los Angeles County Bar Association

Gary B. Normoyle
Director - Engineering and Construction

SUMMARY OF EXPERIENCE

Mr. Normoyle is a senior executive with over thirty years of demonstrated leadership skills with a proven track record of success in engineering, construction, development, project management and marketing of large central station power plants. Plant fuel sources included natural gas, coal, biomass and municipal waste. Mr. Normoyle is responsible for project management, engineering, design, construction for new projects. He processes all necessary applications to procure and maintain all federal, state and local permits and approvals necessary for the construction and operation of the projects undertaken by the company.

EXPERIENCE

- Morris Cogen, LLC: Provides engineering support for project financing, and on-going operations.
- Wildflower Energy: Provides engineering support for acquisition, financing, and on going operation.
- Ivanpah Energy Center: Provided engineering for development activities including permitting and construction contracts.
- Responsible for asset management, engineering, construction, P&L, and operations of company-owned generation projects for Catamount Energy.
- Developed and implemented Catamount's annual strategic business plan and annual budgets.
- Provided all technical engineering support for all of Catamount's new company owned and joint venture projects.
- Responsible for design, procurement, construction, and start-up of projects and all construction related contract negotiations for Catamount.
- Directed operations and maintenance for all of Catamount's projects and negotiated all contracts for fuels, operations, and maintenance.
- Rolls Royce/Catamount Energy: Construction Management for the 100MW peaking Heartland Project in Fort Dunlop, U.K., 1999.
- Fibrowatt, Ltd./Catamount Energy: Construction/Asset Management for the 40MW Biomass Thetford Project in U.K., 1999.
- Summersville Hydroelectric Plant: Development, Licensing, Construction/Asset Management and Financing for the 80 MW Hydroelectric Project in West Virginia, 2000.
- Glenn's Ferry Cogeneration Partners, Construction/Asset Management and Financing for two 10MW Cogeneration Projects, Idaho, 1996.
- Appomattox Cogeneration: Asset Management for a 40MW Coal/Black Liquor Project, Virginia, 1998.
- Rumford Cogeneration, Asset Management for a 40MW Biomass Project, Rumford, Maine, 1995.
- Williams Lake Project: Asset Management for a 50MW Biomass Project, Williams Lake, British Columbia, 1994.

EMPLOYMENT

▪ Diamond Generating Corporation	Director Of Engineering	2001 - present
▪ Catamount Energy Corporation	Vice President, Engineering & Operations	1994- 2000
▪ LG&E Power Systems/Ultrasystems	Director of Marketing	1984-1994
▪ Washington Water Power Company	Engineering Manager	1979-1984
▪ Bechtel Power Corporation	Senior Mechanical Engineer	1972-1979

EDUCATION

California State University, Fresno – Bachelor of Science, Mechanical Engineering

Thomas Priestley, Ph.D., AICP/ASLA

Senior Environmental Planner

Education

Ph.D., Environmental Planning, Department of Landscape Architecture, University of California, Berkeley, 1988
M.C.P., City Planning, Department of City and Regional Planning, University of California, Berkeley, 1976
M.L.A., Environmental Planning, Department of Landscape Architecture, University of California, Berkeley, 1974
B.U.P., Urban Planning, Department of Urban and Regional Planning, University of Illinois, 1969

Professional Affiliations

American Institute of Certified Planners (Certified Planner No. 008919)
American Planning Association
American Society of Landscape Architects

Distinguishing Qualifications

- Broad training in planning, natural resources, and applied social science.
- Over 30 years of professional experience as a professional urban/environmental planner, university professor, and researcher.
- Skilled in developing work programs and budgets, assembling and managing interdisciplinary project teams, providing quality control, and integrating study findings into appropriate documentation.
- Visual assessment specialist with involvement in over 100 visual assessment efforts.
- Skilled in scoping aesthetic and urban design issues and in developing and implementing the appropriate analyses.
- Experienced in the preparation of analyses that meet the requirements of the National Environmental Policy Act (NEPA),the California Environmental Quality Act (CEQA), the Federal Highway Administration (FHWA), the Bureau of Land Management (BLM), and the US Forest Service (USFS).
- Broad knowledge of methods used for siting electric generation, transmission, and substation facilities and mitigating their land use and aesthetic effects.
- Considerable experience in evaluating the potential aesthetic and shadow flicker effects of proposed wind power projects.

- Has conducted widely cited research on the perceptions and property value impacts of electric transmission lines and has consulted on electric facility property value issues.

Relevant Experience

Dr. Priestley, a Senior Environmental Planner based in CH2M HILL's Los Angeles, California office, is the leader of the firm's visual resources practice group. In this role, Dr. Priestley guides the company's visual resources work through issue scoping, development of study designs, mobilization of staff and technologies appropriate to the assignment, guidance of analysis activities, and senior review of final products. In addition, Dr. Priestley consults directly in cases that require special visual resources expertise and he provides expert witness testimony when required.

Dr. Priestley has more than 30 years of professional experience in urban and environmental planning and visual resource assessment. He is known nationwide for his expertise in evaluating aesthetic, land use, property value, and public acceptance issues related to electric energy projects. His experience includes projecting community land use development trends to determine facility needs and optimal location; assessing land use and visual effects of proposed infrastructure facilities; conducting studies of public perceptions of project visual effects; evaluating the property value effects of electric transmission lines; and evaluating the shadow flicker effects of wind power projects. Through his project experience and research conducted for utility clients, Dr. Priestley has developed expertise in methods used for siting electric generation, transmission, and substation facilities and mitigating their land use, aesthetic, and other environmental effects. As editor or co-author, he has made major contributions to Edison Electric Institute publications related to understanding and evaluating the environmental effects of electric facilities.

Representative Projects

Wind Power Projects

Senior Consultant. NextEra Energy Resources. North Sky River Project. **Kern County, CA.** Senior Consultant for a study of a proposed wind energy project on a site in the southern Sierra Nevada Mountains , 15 miles north northwest of Mojave. Analyses, including the use of zone of visual influence mapping and visual simulations, are being incorporated into a technical report to accompany both Bureau of Land Management Plan of Development and County applications, and to support County's development of an Environmental Impact Report.

Senior Consultant. Terra-Gen Power, LLC. Alta East Wind Project. **Kern County, CA.** Senior Consultant for a study of a proposed 300-megawatt wind energy project (up to 120 wind turbine generators within an approximately 3,700-acres site). Project site is located in the eastern Tehachapis, west of Mojave, on private and federally-managed land. Analysis, including zone of visual influence mapping and visual simulations, were used in the technical report prepared to accompany both Bureau of Land Management Plan of Development and County applications, and to support County development of an Environmental Impact Report.

Senior Consultant. First Wind. Kawailoa Wind Farm Facility. **Oahu County, HI.** Senior Consultant for analyses related to a proposal for a 45 turbine wind power project on a site in an agricultural area on the north shore of the island of Oahu. Oversaw the analysis of the project's

potential zone of visual influence, and the analysis of the project's potential shadow flicker effects.

Task Lead. Air Force Center for Engineering and the Environment. Visual Analysis of Proposed Wind Turbine Developments at the Massachusetts Military Reservation, Bourne, MA. Designed and directed the analysis of the potential aesthetic effects of a proposal to develop a single 1.65-MW turbine, and subsequently, a proposal for three to four additional wind turbines, on the crests of glacial moraines at the Massachusetts Military Reservation on Cape Cod. These analyses include an innovative use of GIS tools and data to develop mapping of potential turbine visibility that takes into account the role of distance, vegetation, and structures in reducing potential turbine visibility and visual effects. This mapped analysis was used as a basis for assessing potential project visual effects on sensitive viewers and on views from the many historic sites in the project area. This analytic mapping, supplemented with photo documentation of views from sensitive areas, was incorporated into visual resource reports that responded to the requirements of the National Environmental Policy Act and of the Massachusetts Historical Commission.

Task Lead. Iberdrola Renewables. Blue Creek Wind Farm, Van Wert and Paulding Counties, Ohio. To meet the requirements of the Ohio Power Siting Board permit application process, designed and prepared the analysis of the potential aesthetic effects of a proposal to develop a 167 turbine wind farm and 115-kV transmission line in an agricultural area in northwest Ohio. Issues evaluated included the project's potential impacts on views from nearby residences, communities, and travel routes. Oversaw the analysis of the project's potential shadow flicker impacts and prepared the shadow flicker analysis report.

Senior Consultant. Iberdrola Renewables. **Cayuga Ridge Wind Farm, Livingston County, Illinois.** Supervised the site field work and preparation of simulations for this 300-MW wind farm proposed for development by in an agricultural area near Streator. Oversaw the analysis of the project's potential shadow flicker impacts and prepared the shadow flicker analysis report.

Senior Consultant. Iberdrola Renewables. Hays Wind Project. Ellis County, Kansas. Provided senior review for preparation of a set of photo-simulations for a proposed wind farm facility. Working with a set of views provided by client, oversaw selection of Key Observation Points (KOPs) based on analysis of potentially sensitive visual receptors. Guided preparation of deliverables that included "view cone" figures, indicating on an aerial graphic which exact simulated objects would be visible in the simulated view. Provided senior review of all work products.

Task Lead. Horizon Wind Energy. Antelope Ridge Wind Farm, Union County, Oregon. Senior task lead for the preparation of Exhibit L (Impacts on Protected Areas) and Exhibit R (Scenic and Aesthetic Values) for the EFSEC permit application for this 300-MW wind farm. Specialized analyses included detailed visibility studies from the City of Union and the Oregon Trail. Prepared materials related to the project's visual issues to support public outreach activities and participated in the project's public information meeting. Prepared simulations to depict the project's appearance, including a simulation to counter a citizen-prepared simulation circulating in the community that grossly misrepresented the project's appearance and visual effects.

Task Lead. Orion Wind Energy. Biglow Canyon Wind Power Project, Sherman County, Oregon. Designed and conducted the analysis of the potential aesthetic effects of a proposal to develop up to 218 1.5-MW turbines in an agricultural area in north central Oregon. Assessed effects on views from scenic, aesthetic, and protected areas defined by the Oregon Electric Facility Siting Council (EFSEC). Based on these analyses, prepared Exhibit L (Impacts on Protected Areas) and Exhibit R (Scenic and Aesthetic Values) of the EFSEC permit application.

Task Lead. Third Planet Wind. Reno Junction Wind Farm Project, Campbell County, Wyoming. Designed and prepared the analysis of the potential aesthetic effects of a proposal to develop a 200-MW wind farm and 230-kV transmission line on privately owned ranch lands located approximately 34 miles southwest of Gillette. This analysis became the Visual Resource chapter of the project's Environmental Assessment required by the Wyoming State Industrial Siting Act permit process.

Task Lead and Expert Witness. PacifiCorp. Dunlap Ranch Wind Energy Project, Carbon County, Wyoming. Designed and supervised the analysis of the potential aesthetic effects of a proposal to develop a 111-MW wind farm and 230-kV transmission line on privately owned ranch lands located approximately 7.5 miles north of Medicine Bow. This analysis became the Visual Resource chapter of the project's Environmental Assessment required by the Wyoming State Industrial Siting Act permit process. Provided expert witness testimony before the Wyoming Industrial Siting Board on the project's aesthetic issues.

Task Lead. Duke Energy. Top of the World Windpower Project, Carbon County, Wyoming. Designed and supervised the analysis of the potential aesthetic effects of a proposal to develop a 99-MW wind farm and 230-kV transmission line on privately owned ranch lands located north of Glen Rock. This analysis became the Visual Resource chapter of the project's Environmental Assessment required by the Wyoming State Industrial Siting Act permit process. Special attention was focused on potential visual effects on the nearby community of Rolling Hills.

Task Lead. Duke Energy. Campbell Hill Wind Power Project, Converse County, Wyoming. Designed and supervised the analysis of the potential aesthetic effects of a proposal to develop a 100-MW wind farm and 230-kV transmission line on ranch lands in the area north of Glenrock. This analysis became the Visual Resource chapter of the project's Environmental Assessment required by the Wyoming State Industrial Act permit process.

Task Lead. Horizon Wind Energy. Simpson Ridge Wind Power Project, Carbon County, Wyoming. To meet the requirements of the Wyoming State Industrial Act permit process, designed and supervised the analysis of the potential aesthetic effects of a proposal to develop a 154 turbine wind farm and 230-kV transmission line on ranch lands in the area south of Hanna and Medicine Bow. Issues evaluated included the project's potential impacts on views from nearby communities, historic U.S. Route 30, and the historic Carbon town site and cemetery.

Task Lead. Shell Wind Energy. Sand Hills Wind Power Project, Albany County, Wyoming. To meet the requirements of the Wyoming State Industrial Act permit process, designed and conducted the analysis of the potential aesthetic effects of a proposal to develop 25 2.0-MW turbines on top of a mesa visible from the nearby community of Rock River and historic U.S. Route 30.

Senior Consultant. Iberdrola Renewables. Juniper Canyon Wind Project, Klickitat County, WA. Provided senior review for the visual impact analysis conducted for this to 250-MW

project proposed by. Also oversaw the analysis of the project's potential shadow flicker impacts and prepared the shadow flicker analysis report.

Task Lead and Expert Witness. Zilkha Renewable Resources. Kittitas Valley Wind Power Project, Kittitas County, WA. Designed and conducted the analysis of the potential aesthetic effects of a proposal to develop up to 121 1.3-MW to 2.5-MW turbines on ridge lands in a rural area in north-central Kittitas County. Assessed effects on views from nearby roadways and residences and recommended mitigation measures to attenuate impacts. Prepared the aesthetics chapter for the permit application to the Washington Electric Facility Siting Council (EFSEC) and provided written and oral expert testimony at several stages of the licensing process.

Task Lead and Expert Witness. Zilkha Renewable Resources. Wild Horse Wind Power Project, Kittitas County, WA. Designed and conducted the analysis of the potential aesthetic effects of a large wind turbine installation proposed for Whiskey Dick Mountain in eastern Kittitas County. Assessed effects on views from nearby roadways and residences and recommended mitigation measures. Prepared the aesthetics chapter for the permit application to the Washington Electric Facility Siting Council (EFSC). Prepared written expert witness testimony and provided oral testimony before EFSEC.

Task Lead. Puget Sound Energy. **Wind Power Due Diligence Analysis, Puget Sound Energy, Kittitas County, Washington. C**onducted a due diligence analysis of the aesthetic issues associated with a proposed 180-MW wind farm being considered as a candidate for Puget Sound Energy's power purchase portfolio. Reviewed project plans, the project aesthetic analysis, and other sources of information to assess the project's aesthetic issues, the adequacy of the analysis by another consultant, and the potential implications of the aesthetic issues for the project's viability.

Solar Projects

Senior Consulant and Expert Witness. Solar Reserve. Rice Solar Energy Project, Riverside County, CA. Senior reviewer for the AFC visual resource analysis prepared by CH2M HILL's visual resources staff for a solar thermal project proposed by for development on 3,325 acres of privately owned land on the site of the former Rice Army Airfield in the Mojave Desert region of eastern Riverside County. Provided expert testimony before the California Energy Commission, leading to a determination by the CEC that the aesthetic impacts of the project would be less than significant.

Senior Consultant and Expert Witness. Bright Source Energy. Ivanpah Solar Electric Generating System, San Bernardino County, CA. Senior reviewer for the AFC visual resource analysis prepared for a solar thermal project proposed by for development on 3,400 acres of Federal land managed by the BLM that are located in the desert region of eastern San Bernardino County, approximately 5 miles southwest of Primm, NV. Prepared detailed studies of impacts of project on views from nearby Wilderness and National Monument lands and provided expert witness testimony on the visual resources issues before the California Energy Commission.

Senior Consultant. NextLight. Silver State Photovoltaic Power Project, Clark County, NV. As the Senior Consultant, oversaw the preparation of the Federal EIS visual resource assessment for a proposal to develop a photovoltaic power plant on 7,840 acres of Federal land managed by the BLM that are located immediately east of Primm, Nevada.

Senior Consultant. NRG Solar. Alpine Solar Generating Station, Los Angeles County, CA. As the Senior Consultant, oversaw the preparation of the visual resources technical report for a proposal to develop a photovoltaic power plant on 800 acres of privately owned desert land located in the Antelope Valley in northern Los Angeles County. Issues included potential visibility of the project from nearby residential areas and a state park and a state reserve.

AT&T Solar. Pilot Initiative, Analysis of Potential Visual Effects, San Ramon, CA. Analyzed the potential aesthetic effects of a 1.1-MW DC solar photo voltaic system proposed for installation on the roof of the AT&T headquarters building. Identified and photo documented views from sensitive viewing areas and directed production of visual simulations to depict the appearance of the installed PV system. Prepared a report that presented the simulations, evaluated the project's effects on the views, and addressed concerns about the potential for the system to create glare effects.

Task Lead. Iberdrola Renewables. Hyder Valley Solar Thermal Project, Maricopa County, AZ. As the visual resources task lead, now preparing the Federal EIS visual resource assessment for a proposal by to develop a solar thermal power plant on 1,980 acres of BLM managed Federal land located east of Hyder, Arizona.

Senior Consultant. Cogentrix. Alamosa Solar Project, Alamosa County, CO. As the Senior Consultant, oversaw the preparation of the visual resources technical report for a proposal by Cogentrix Solar Services to develop a 30-MW photovoltaic solar generation facility entailing use of 540 High Concentration Photovoltaic (HCPV) trackers on privately owned agricultural lands located north of Alamosa, Colorado.

Wave Energy Projects

Senior Consultant. Pacific Gas & Electric Company. Wave Connect Pilot Project. Humboldt County, CA. Senior consultant for analysis of the visual effects resulting from proposed wave energy pilot project located along the coast off of Eureka. Analysis included study of a range of wave energy converters (WEC), as potentially visible from a variety of coastal settings.

Hydroelectric Projects

Idaho Power. Aesthetic and Site Enhancement Studies, Shoshone Falls Hydroelectric Project, Twin Falls and Jerome Counties, ID. Consultant to Idaho Power on the effects of proposed relicensing of the Shoshone Falls hydroelectric project on the aesthetic qualities of the falls and adjacent park. Provided direction for development of the analysis approach for assessing the effects of changes in flows over the falls on the falls' appearance and public expectations. Evaluated the project in light of local government and land management agency plans and policies, designed and implemented special perception studies that included use of focus groups and surveys, and worked with an advisory committee of representatives of local governments and state agencies. Based on this process, recommended mitigation and enhancement measures. Assisted in preparing a visual analysis report for incorporation into the Exhibit E submitted to Federal Energy Regulatory Commission (FERC).

Portland General Electric. Willamette Falls Hydroelectric Project, Oregon City and West Linn, Oregon. As part of the APR process, prepared analyses of visual resources issues that included evaluations of the appearance of the falls under varying flow conditions, as well as assessments of the relationship of project structures to the project's landscape setting.

Puget Sound Power and Light. FERC Exhibit E, Snoqualmie Falls Hydroelectric Project, King County, Washington. Analyzed the aesthetic implications of a proposal to increase the capacity of a generating plant at Snoqualmie Falls. Assessed impacts of structural changes and changes to flows over the falls. Developed and applied a methodology for evaluating the effects flow changes would have on the falls' appearance. Prepared the aesthetics section of Exhibit E of the relicense application. Developed the script for a video regarding the aesthetics issues submitted to the FERC.

California Department of Water Resources. Oroville Facilities Hydroelectric Project, Oroville, CA. As part of an Applicant Prepared Relicensing (APR) process, responsible for preparation of initial project documents. Developed outlines and work plans; coordinated with the Department of Water Resources and environmental specialists for each of the issue areas; assembled drafts; edited text; designed final reports; and supervised report production. Responsible for analysis of the visual resource issues associated with the project's reservoir, forebay, afterbay, canals, dam structures, power houses, and fish ladder facility. Technical advisor to the Land Use, Land Management, and Aesthetics Work Groups, requiring participation in sessions involving agency staff, representatives of Indian Tribes and Non-Governmental Organizations, and members of the general public.

Northern California Power Authority. Ramsey-French Meadow Hydro Project, FERC Initial Scoping, Stanislaus National Forest, California. Scoped visual issues associated with a hydroelectric project proposed for the North Fork of the Stanislaus River. Responsible for coordinating with Forest Service landscape personnel, reviewing Forest Service and county plans, field evaluation of landscape conditions, preparing the visual effects section of the FERC-mandated Initial Scoping document, and preparing a plan for assessing aesthetic issues.

Hydro-Québec. Environmental Evaluation of Proposed Modifications to Existing Hydroelectric Facilities. Documented FERC procedures and guidelines for environmental assessment of proposed changes to existing hydroelectric projects. Documented hydroelectric facility upgrades undertaken by the U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers. Collected procedures, guidelines, and examples of project environmental assessments and post-construction monitoring studies prepared by or for these agencies.

Thermal Generating Facilities

Various Clients. Visual Resource Impact Analyses of Gas-fired Power Plants, Various Locations, California. Evaluated potential visual resources impacts of more than 20 gas-fired power plants proposed for a variety of urban and rural settings in California. Identified visual issues, designed the analysis strategies, contributed to development of architectural and landscape treatments, prepared visual resources analyses for the Applications for Certification for submittal to the California Energy Commission, reviewed and critiqued relevant sections of the Energy Commission's analyses of the projects, and evaluated the visual issues associated with CEC-proposed alternative sites. As an expert witness on visual resources, prepared written testimony and provided oral testimony in hearings before the California Energy Commission.

Calpine. Power Plant Fatal Flaw Analyses, Various California Locations. Conducted initial scoping of visual issues of candidates sites for the development of combined cycle power plants. Identified visual resource constraints on the use of the sites for a power plant and recommended siting and design measures to reduce visual impacts.

Dominion Energy. Visual Impact of Cooling Tower Alternatives for the Manchester Street Generating Station, Providence, Rhode Island. Evaluated the visual impacts of alternative cooling tower options considered for a large combined cycle gas-fired power plant located at a visually prominent site on the Providence waterfront. Scoped the issues, directed the preparation of analytic maps, identified and photo documented critical viewpoints, and directed the production of visual simulations depicting the three alternative cooling tower structures and the steam plumes associated with them. Evaluated the visual impacts of the alternatives on the critical viewpoints, and prepared a report documenting the analysis for submission to the Rhode Island Department of Environmental Management.

Dominion Energy. Visual Impact of Cooling Tower Alternatives for the Salem Harbor Generating Station, Salem, Massachusetts. Evaluated the visual impacts of three alternative cooling tower options being considered for development at a large harborside coal-fired power plant located in close proximity to historic and cultural resources of national importance. Scoped the issues, directed the preparation of analytic maps, identified and photo documented critical viewpoints, directed the production of visual simulations depicting the three alternative cooling tower structures and the steam plumes associated with them, evaluated the visual impacts of the alternatives on the critical viewpoints, and prepared the report documenting the analysis for submission to the U.S. Environmental Protection Agency.

Mid American Energy. Salton Sea Geothermal Unit 6, Imperial County, CA. Assisted with the licensing of a 185 MW geothermal power plant, associated steam wells, and 31 miles of transmission line proposed for a site adjacent to the Salton Sea and the Sonny Bono Salton Sea National Wildlife Refuge. Conducted supplemental aesthetic analyses to respond to requests for additional information by the California Energy Commission, reviewed and critiqued the CEC Preliminary and Final Staff Assessments, and provided testimony at project workshops.

Glenwood Springs Cogeneration Plant and Transmission Line, Garfield County, CO. Analyzed the aesthetic impacts of a proposed 25-MW cogeneration/desalinization plant. Assisted with the alignment selection for the transmission line associated with the plant, and evaluated the line's visual effects.

Transmission Lines and Substations

Montana Department of Environmental Quality. Mountain States Transmission Intertie Project, Montana and Idaho.. Technical lead for the visual resources impact and property value impact assessments of a 400-mile, 500-kV transmission line being proposed by Northwest Power. The assessment was designed to fulfill the analytic requirements of the Montana Department of Environmental Quality, the U.S. Forest Service and the U.S. Bureau of Land Management. As the technical lead for this task, designed the analysis strategy and directed its implementation by a team that included CH2M HILL staff and other team partners.

Southern California Edison. Tehachapi Renewables Transmission Project, Southern California. Technical lead for the analysis the visual impacts of a proposed 190-mile, 500-kV transmission line. The route traversed a diverse and complex set of landscapes that include open lands in the Antelope Valley, National Forest lands in the San Gabriel Mountains valued for their recreational and scenic importance, and highly developed urban areas in the San Gabriel Valley. Designed the analysis strategy that was implemented by a team of five

CH2M HILL visual resource specialists, who were supported by CH2M HILL planners and GIS, visual simulation, graphics, and report production staff.

Southern California Edison. Antelope-Pardee 500-kV and Antelope Segments 2 and 3 Transmission Projects; Southern California Edison; Los Angeles County, California. Assisted SCE in responding to controversial project visual impact issues and proposed visual impact mitigation requirements associated with these two 500-kV transmission line projects. Reviewed and critiqued the visual resource impact analysis prepared by the CPUC's visual consultant, conducted focused analyses of visual issues on which there was disagreement with the CPUC consultant's conclusions, prepared written reports for filing with the CPUC, and participated in working sessions with CPUC and US Forest Service visual resources staff to resolve issues.

Southern California Edison. Eldorado to Ivanpah 220-kV Transmission Line, Proponent's Environmental Assessment, San Bernardino County, CA and Clark County, NV. Provided senior guidance and review for the preparation of the PEA visual resources impact analysis of a proposal by SCE to develop a new 36-mile 220-kV transmission line between the Eldorado Substation and a new Ivanpah Substation located in eastern San Bernardino County, CA, 7 miles southwest of Primm, NV.

Tucson Electric Power. **Saguaro to North Loop Transmission Line Project, Pinal and Pima Counties, Arizona.** Supervised the visual impact analysis of a proposed 14-mile, 138-kV four circuit transmission line. The route traveled through an open and complexly vegetated desert landscape, passing close to several areas of residential development. The visual analysis was designed to meet the requirements of the Arizona Corporation Commission Power Plant and Transmission Line Siting Committee.

Pacific Gas and Electric. Jefferson-Martin Transmission Project, Proponent's Environmental Assessment, San Mateo County, California. Senior reviewer and consultant for an analysis of the aesthetic issues associated with the proposed replacement of a 14.7-mile segment of an existing electric transmission line with a 230-kV line on larger towers. The transmission line's location in an open space area prized for its scenic qualities and in proximity to affluent residential areas made the visual issues a sensitive and critical dimension of this project, requiring an intensive degree of analysis. Contributed to a detailed critique of the PUC's conclusions regarding project aesthetic effects. Prepared written expert witness testimony.

Bonneville Power Administration. Kangley-Echo Lake Transmission Line, King and Kittitas Counties, Washington. Analyzed the potential aesthetic impacts of four alternative routes for a proposed 500-kV transmission line with a total length of approximately 120 miles through forest, recreation, scenic corridor, and rural and suburban residential areas. Supervised the preparation of photo simulations and Geographical Information System (GIS) analyses. Prepared the technical report documenting the analysis.

Pacific Gas and Electric. Tri-Valley Transmission Upgrade, Project Proponent's Environmental Assessment, Alameda County, California. Analyzed aesthetic issues associated with a system of new 230-kV electric transmission lines and substations proposed by Pacific Gas and Electric Company (PG&E) to upgrade service to the Livermore/Pleasanton/San Ramon area. Scoped issues and evaluated a large set of candidate routes to aid selection of a smaller set of preferred routes. Conducted detailed visual analyses of the preferred routes, wrote the draft

of the visual analysis report, and proposed mitigation measures in preparation for filing a permit application with the California Public Utilities Commission (CPUC).

Southern California Edison. Valley-Auld Transmission Line Proponent's Environmental Assessment, Riverside County, CA. Scoped visual issues associated with a proposed 12-mile, 115- kV transmission line, conducted visual analyses, prepared the visual analysis report, and proposed mitigation measures to reduce project's visual effects to less than significant levels in preparation for filing of a permit application with the CPUC.

Ketchikan Public Utilities. Swan Lake/Lake Tyee Transmission Project, Tongass National Forest, Alaska. Prepared visual section of the Environmental Impact Statement (EIS) for a 60-mile transmission line and associated access roads proposed for Forest Service lands in Alaska's southeast peninsula. Coordinated with Forest Service planning and visual resource management specialists, reviewed Forest Service Visual Resource Management analyses and policies for the project area, analyzed existing landscape conditions, evaluated the aesthetic effects of similar facilities that already exist in the region, provided advice about siting of the route alternatives, analyzed the visual effects of the alternatives, and developed mitigation strategies.

California Energy Commission. Geothermal Public Powerline, Lake and Colusa Counties, California. Consultant to the CEC for evaluating the aesthetic impacts of a transmission line proposed to link the Geysers geothermal area and the Central Valley. Inventoried landscape conditions and reviewed the project proponent's visual impact assessments. Developed independent evaluations of the project's effects on landscape quality in developed communities, resort areas, along scenic highway corridors, and in other sensitive areas, and proposed mitigation measures.

Colusa County Planning Department. Colusa County Transmission Line Element, Colusa County, California. Consultant to a team that developed an element for the Colusa County General Plan to guide the siting and design of new electric transmission lines. Summarized the literature on transmission line effects and on siting and design options for impact mitigation, developed an analysis framework, provided technical review of all final products, and prepared the chapter on aesthetic issues. The aesthetic assessment included survey and evaluation of the County's current landscape conditions and sensitivities and development of siting and design guidelines.

Hydro-Québec. Development of a New Method for Considering Aesthetic Issues in Transmission Line Siting, Québec, Canada. For Hydro-Québec, provided conceptual review and research assistance for its efforts to evaluate and revise approaches to addressing transmission line aesthetic issues in project planning, siting, and design.

Hydro-Québec and Electricité de France. Environmentally Sensitive Design of Transmission and Substation Equipment. Developed an inventory and assessment of the experience of U.S. utilities in developing new transmission and substation equipment designs to reduce aesthetic and other environmental impacts. Activities included literature review, survey of utility engineers and planners, interviews with utility personnel, and documentation and synthesis of findings.

Hydro-Québec. Design Solutions for Mitigation of Substation Impacts. Documented the experience of utilities in the U.S., Canada, France, and Japan in developing design solutions

intended to integrate urban substations into their settings. In addition, documented measures used by U.S. utilities to respond to environmental issues associated with modifications of existing substations.

Hydro-Québec, Electricité de France, BC Hydro, the Bonneville Power Administration, and Southern California Edison. International Electric Transmission Perception Project. Managed a multi-year research program co-sponsored by Hydro-Québec, Electricité de France, BC Hydro, the Bonneville Power Administration, and Southern California Edison. Managed a team of planners and social scientists conducting research aimed at developing and applying standardized methods for surveying the public's perceptions of the impacts of high-voltage transmission lines. Identified transmission line siting issues and information needs, summarized and evaluated existing research findings, participated in developing a conceptual framework for understanding the public's perceptions, and contributed to developing a master plan and design for preparing and testing standardized survey instruments.

Study of Public Perceptions of a Transmission Line in a Residential Neighborhood, Vallejo, California. Designed and conducted a survey of resident perceptions of a newly upgraded 115/230-kV transmission line in a neighborhood of single-family homes. Conducted advanced analysis and interpreted the findings. Published the results as a research report and journal article.

Hydro Québec. Transmission Line Undergrounding and Under River Crossings. Conducted a set of case studies documenting and analyzing controversies over the siting of electric transmission lines in which demands were made for placing lines underground or under water.

Edison Electric Institute. Transmission Line Effects on Land Use Development. Identified and evaluated transmission line siting cases in which concerns about line impacts on future development were a major concern. Reviewed the literature on transmission line impacts on land use development and proposed a program for further research.

Pacific Gas and Electric. Transmission Line Land Use and Aesthetic Issues. Analyzed land use and aesthetic issues associated with transmission lines and prepared policy papers for submission to the California Public Utilities Commission.

Electric Facility Property Value Effects

New York Regional Interconnect Project (NYRI), New York State. For the New York Regional Interconnect project, designed and implemented an analysis of the potential effects of a 400-kV DC transmission line proposed to extend from Utica to Middletown on property values and tourism and the tourist economy in the communities through which it would be routed. Prepared technical reports and written testimony for submission to the New York Public Service Commission.

Sacramento Municipal Utility District. Upper American River Project Property Value Impact Assessment, El Dorado County, California. Task lead for the assessment of the potential impacts of a pumped storage facility and an associated transmission line and road improvement project on the sales value of privately owned properties. The approach included mapping of the facilities and privately owned lots in proximity to them, identification of visual and other project-related effects potentially having an impact on those lots, and review and application of the findings of the relevant property value impact research literature.

Dominion Technical Solutions. Expert Witness Testimony on Transmission Lines and Property Values, Richmond, VA. Prepared expert witness testimony on transmission line property value effects for presentation to the Emerging Technology Issues Advisory Committee of the Virginia General Assembly Joint Commission on Technology and Science. The testimony included a written report that reviewed and summarized the results of a comprehensive search and evaluation of the published literature documenting empirical research on the relationships between transmission lines and the sales prices of nearby properties. This report updated the literature review prepared for EEI to incorporate the literature published between 1990 and 2005.

Edison Electric Institute. Review of the Literature on Transmission Line Effects on Property Values. With Cynthia Kroll, co-author of an Edison Electric Institute-sponsored bibliography and critical review of studies on the relationships between transmission lines and the value of residential property that were published between 1975 and 1990.

Edison Electric Institute. Guide to Conducting Research on Transmission Line Property Value and Aesthetic Effects. Co-author of an Edison Electric Institute guidebook for utility staff on the design and implementation of research on the effects of electric transmission lines on perceptions and property values in residential neighborhoods. Co-authored and assisted in the production of an accompanying videotape.

Southern California Edison. Study of Transmission Line Effects on Property Values, Pacific Consulting Services, Albany, California. Consultant and major contributor to the design and implementation of a research project sponsored by Southern California Edison that used hedonic modeling to evaluate the property value effects of transmission lines in a cross section of suburban residential neighborhoods.

Water Resources Projects

U.S. Army Corps of Engineers Washington Aqueduct Division. Washington Aqueduct Residuals Management EIS, Washington, D.C. Scoped the aesthetic issues related to new facilities and landscape modifications associated with alternative measures for disposal of water treatment residuals, and designed and implemented a strategy for assessing the aesthetic impacts to provide a basis for comparing the alternatives and preparing the NEPA EIS.

Los Angeles Department of Water and Power. LADWP Headworks EIR, Los Angeles County CA. Provided issue scoping, analysis design, and senior review for an assessment of the potential aesthetic effects of a proposal to construct a large enclosed reservoir at a location near Griffith Park to replace the treated water storage capacity now provided by the Silver Lake Reservoir.

Metropolitan Water District. Visual Assessment/Mitigation Recommendations for the San Joaquin Reservoir, Newport Beach, CA. Evaluated visual impacts of proposed alternative reservoir cover and water treatment plant options for a water supply facility located in an affluent residential area. Developed a proposal for design mitigation measures that led to project acceptance by residents of the neighborhood overlooking the reservoir.

Red Bluff Diversion Dam, Tehama County, CA. Developed the analysis plan for and directed the assessment of the aesthetic changes associated with a set of alternatives being considered for changes in management of the Red Bluff Diversion Dam to enhance passage for anadromous

fish. Changes being considered included construction of a massive pumping facility, new fish ladders, and a dam bypass and elimination of an aesthetically and recreationally important lake created by the dam either entirely, or for all but two or four months of the year. The analysis, which included preparation of simulations, was summarized in an aesthetics chapter prepared to meet the requirements of both the NEPA and CEQA.

Upper Penitencia Creek Flood Control Study EIS/EIR, Santa Clara County, CA. Provided issue scoping, analysis design, and senior review for an assessment of the potential aesthetic effects of alternative flood control measures for an urban creek with highly valued visual qualities.

Landfill and Remediation Projects

Waste Connections, Inc.Chiquita Canyon Landfill, Expansion, Los Angeles County CA. Currently providing issue scoping, analysis design, and senior review for an assessment of the potential aesthetic effects of a proposed expansion of the Chiquita Canyon Landfill. The analysis strategy has included documentation of the visual effects of existing landfills in Southern California that are comparable to what is being considered at Chiquita Canyon. In addition, studies are being conducted of the potential visibility of alternative fill levels and patterns at Chiquita Canyon, and assessments are being made of the changes the alternatives would have on views from sensitive locations.

Waste Management. Kettleman Hills Landfill Project, Kings County, CA. Conducted analyses of the potential aesthetic effects of a major expansion of the Kettleman Hills Landfill. The analysis included identification of sensitive viewpoints in the surrounding area and preparation of visual simulations of the effects of the proposed expanded landfill areas on these views. Presented the results of the analysis in the form of the visual resources chapter of the Project Environmental Impact Report.

Calpine. Relocation of KFAX Radio Towers at the Old West Winton Landfill, Alameda County, CA. Analyzed the aesthetic implications of relocating a set of four 228-foot-high radio transmission towers on a closed landfill site adjacent to a major public open space area. The analysis included development of visual simulations and an investigation of options for establishment of screening landscaping on top of the landfill's cap.

East Bay Municipal Utility District. Penn Mine Remediation Project, Calveras County, CA. Evaluated the visual impacts of a mine waste remediation project in the watershed of the East Bay Municipal Utility District's Camanche Reservoir. Assessed the visual implications of the removal of mine spoils, landfilling of the spoils, regrading of slopes, and revegetation of affected lands. The focus was on impacts of these changes on the views experienced by recreational users on the adjacent reservoir.

Transportation Projects

Riverside County Transportation Commission. SR 79 Environmental Document Visual Impact Technical Study, Riverside County, California. Directed the analysis of the potential aesthetic impacts of alternative alignments of a 20-mile-long freeway planned for the rapidly developing San Jacinto Valley. Landscape conditions range from rural to suburban. Applied FHWA procedures to develop an analysis consistent with Caltrans specifications. Directed the work of the landscape sub preparing conceptual landscape plans.

Caltrans. SR-47 Environmental Document Visual Impact Technical Study, Los Angeles County, California. Currently directing the analysis of the potential aesthetic impacts of alternatives for the replacement of the Schuyler Heim Bridge and for construction of an elevated freeway to connect SR-47 with the Alameda Avenue expressway. The project is located in a visually complex region that includes the Ports of Los Angeles and Long Beach and nearby industrial, recreational, and residential areas. Applying FHWA procedures to develop an analysis consistent with Caltrans specifications.

U.S. 36 Transportation Corridor, Denver, Adams, and Boulder Counties, Colorado. Provided senior review of the aesthetic analysis of the U.S. 36 transportation corridor project which entailed assessment of the aesthetic implications of a set of alternatives that included widening of an existing freeway, addition of express toll lanes and bus lanes, and development of a commuter rail facility.

Port of Los Angeles. Berths 97-109 Container Terminal Project, San Pedro, CA. Developed the analysis plan for and implemented the assessment of the aesthetic impacts of a major new terminal proposed for the West Basin area of the Port of Los Angeles. Special attention was given to the visual effects of the ten 248-foot-high shore-side gantry cranes proposed for installation in close proximity to the Vincent Thomas suspension bridge, an important regional landmark.

Port of Los Angeles. Matson Container Terminal Project, San Pedro, CA. Developed the analysis plan for and implemented the assessment of the aesthetic impacts associated with the reactivation of container terminal operations at Berths 206-209.

California High Speed Rail Authority. California High Speed Rail, San Joaquin Valley, California. Senior advisor and reviewer for the analysis of the potential aesthetic impacts of the proposed and alternative high speed rail routes that would extend from Madera to Fresno. The routes included at-grade, and overhead segments that would pass through both agricultural and urban and small town setting settings.

California High Speed Rail Authority. California High Speed Rail EIR, Southern California. For the California High Speed Rail Authority, evaluated the potential aesthetic impacts of a proposed high speed rail route extending from downtown Los Angeles to Downtown San Diego by way of San Bernardino and Riverside. The route included depressed, at-grade, and overhead segments that would pass through a variety of urban, suburban, and rural settings, many of which have highly valued visual qualities. In addition to identifying and documenting potential impacts, recommended measures for impact mitigation.

Bay Area Rapid Transit (BART. Warm Springs Extension, Fremont, CA. Analyzed the aesthetic impacts of a proposed 7.8-mile extension of the BART heavy-rail system from the City of Fremont to Santa Clara County. Prepared the aesthetics section of the CEQA-mandated Environmental Impact Report (EIR).

Santa Clara County T2010 Transportation Plan, San Jose, CA. Evaluated the aesthetic issues associated with the highway, rail, and light rail projects proposed by the Santa Clara County T2010 Transportation Plan and prepared the aesthetics section of the CEQA-mandated EIS.

Centre d'Etude des Transports Urbains. Urban Freeway Design Research, France and U.S. Conducted research **c**omparing American and French approaches to planning and design of

urban freeways to optimize their integration into the urban environment. Research included literature review, interviews with highway engineers and landscape architects in the U.S. and France, review of plans and environmental assessments, and site visits to exemplary projects.

Centre d'Etude des Transports Urbains. Chevilly-Larue Roadway Design Evaluation Study, France. Member of a study team that evaluated the effects of urban design measures intended to improve traffic safety and aesthetics that were installed on a heavily-traveled road through the center of a suburban community. Developed a research strategy and questionnaire for documenting resident perceptions before and after the installation of the measures.

Land Use, Natural Resource, Facility Siting, Light Impact, and Urban Design Studies

Granite Construction Company. Liberty Quarry, Temecula, California. Developed and implemented a plan for analyzing the effects of the nighttime lighting required for large aggregate quarry proposed for a prominently visible hillside located alongside I-15. With the assistance of CH2M HILL lighting engineers, assessed illumination patterns and intensities and evaluated the potential of the project's lighting to spill onto surrounding properties and public spaces, the potential offsite visibility of project lighting, potential glare impacts, and effects on skyglow.

Granite Construction Company. Liberty Quarry, Temecula, California. Evaluated and documented the proposed quarry's potential aesthetic impacts on views from surrounding roadways, rural, and residential areas. Proposed mitigation measures to attenuate the project's aesthetic effects and through use of simulations, evaluated the potential of these measures to lower impacts to acceptable levels.

U.S. Air Force. Galena Ridge Repeater Facility Visual Resources Impact Analysis, Death Valley National Park, CA. Conducted an analysis of the potential visual impacts of a small repeater station proposed for development on a ridgetop site located within the boundaries of Death Valley National Park. Given the site's location within a National Park, the project's potential visual effects required a close level of scrutiny. The study approach entailed building a mockup of the facility, installing the mockup on the site, and documenting its visibility and effects on the landscape as seen from a number of critical viewpoints. The analysis was documented in a technical appendix that supported the aesthetics findings presented in the project Environmental Assessment.

Plum Creek Timber Company. Plum Creek Land Exchange EIS, Mount Baker/Snoqualmie, Wenatchee, and Gifford Pinchot National Forests, WA. Analysis of land status and use, aesthetic, recreation, unroaded area, and wild and scenic river issues associated with the proposed exchange of over 100,000 acres of forest land between the Plum Creek Timber Company and the National Forest system. Assessed public and agency concerns; developed an analysis strategy; used Forest Service GIS data as the basis for map and statistical analyses; collected and made use of supplemental data generated through field work, interviews, and review of published sources; and prepared analyses and summary text for the EIS.

Plum Creek Timber Company. Plum Creek Road Access EIS, Wenatchee National Forest, WA. Analysis of aesthetic, recreation, unroaded area, and wild and scenic river issues associated with the proposed development of over 40 road segments over National Forest lands to provide access to future timber harvest areas on adjacent Plum Creek Timber Company parcels. Assessed public and agency concerns; developed an analysis strategy; used Forest

Service GIS data as the basis for map and statistical analysis; collected and made use of supplemental data generated through field work, interviews, and review of published sources, and prepared analyses and summary text for the project EIS.

Oakland Army Base Disposal and Reuse EIS, Oakland, CA. Analyzed the land use, demographic, aesthetic, odor, and environmental justice issues associated with six different reuse options being considered for the 422-acre Oakland Army Base. Drafted the text for the EIS sections related to these issues. In addition, developed a cumulative effects analysis and summary text that that considered all project environmental issues for each of the reuse options.

Various Clients. Environmental Assessment of Proposed Development Projects, Northern California. For a variety of municipal planning departments, evaluated the aesthetic and urban design issues associated with proposed development projects and prepared the aesthetics sections of the EIRs prepared under CEQA. The projects included a shopping and parking complex located in one of California's most historic town centers, a major suburban hotel complex, a 580-acre residential subdivision, and a set of four downtown parking garages.

Lennane Properties. Centrage Urban Development Project, Sacramento, CA. Developed and applied a methodology for assessing the potential scale and privacy effects of a proposed cluster of high-rise buildings on adjacent single-family residential areas.

Salt River Project. East Anderson Receiving Station Growth Impact Study, Phoenix, AZ. Analyzed the land use development implications of a large electric receiving station proposed for a developing area on the edge of Phoenix. Directed collection, mapping, and analysis of demographic, economic, land use, infrastructure, planning, and policy data, and generation of projections of future land use patterns under project and no-project scenarios.

Pacific Gas and Electric. Growth and Development Studies, Northern and Central California. Designed, scheduled, and managed studies evaluating growth trends and forecasting future population and land use in urban and rural areas throughout Northern and Central California to provide a basis for planning and siting future electric facilities. Supervised work that included coordination with local planning agencies; data gathering and evaluation; analysis of economic, demographic, environmental, infrastructure, and policy data; development of growth projections; and reporting of findings.

Association of Bay Area Governments. Using Land Use Controls to Improve Air and Water Quality, Sonoma County, CA. Contributed to an EPA-sponsored study evaluating links between land use development and air and water quality. Identified and summarized the findings of the relevant literature, developed links with the planning agencies in the study area, and evaluated of the local land use planning and regulatory system to identify its potential role in influencing development to improve air and water quality.

Association of Bay Area Governments. 22Bay Area Open Space Plan, San Francisco Bay Area, CA. Contributed to the revision of the Association of Bay Area Governments' Bay Area Open Space Plan, evaluating open space as a component of visual quality.

University Teaching

Department of City and Regional Planning, University of California, Berkeley. Lecturer Taught CP 214, "Urban and Regional Physical Infrastructure," a graduate-level course

providing a survey of the major infrastructure systems, their characteristics and impacts, and their relationships to the planning of cities and regions.

Department of Urban and Regional Planning, California State Polytechnic University, Pomona. Assistant Professor. Designed and taught undergraduate courses in urban design, and natural factors in planning. Taught studio sections of courses in graphic communication and design and in subdivision design.

Ecole Nationale des Ponts et Chaussées. Paris, France. Visiting Lecturer. Taught "The Urban Environment," a lecture course in English for engineers and planners on environmental quality issues and their treatment in project planning and design.

Departments of Landscape Architecture and City Planning, University of California, Berkeley. Instructor. Co-taught "The Urban Environment" a graduate level course reviewing methods for treating environmental quality issues in the planning and design process. Assisted in teaching "Social Factors in Landscape Design."

Selected Research Reports, Publications and Conference Papers

Aesthetics

Visual Impacts of Renewable Energy Facilities: New Issues and New Strategies for Impact Assessment. Presentation at the Edison Electric Institute/National Rural Electric Cooperative Association Siting Workshop, Phoenix, Arizona. October 6, 2010.

Aesthetic Issues in Wind Power Siting and Licensing. Presentation at the American Wind Energy Association Wind Power Siting Workshop, Denver, Colorado, February 18, 2010

Wind Power Visual Impact Assessment: Practical Issues and Links to Research. Invited Presentation to the National Wind Coordinating Committee Workshop on Technical Considerations in Siting Wind Developments. Washington, DC, December 1, 2005.

Getting it Right with Local Government: Dealing With Aesthetic Issues Up Front. Presentation at the American Wind Energy Association WINDPOWER conference, Denver, May 16-18, 2005.

Technical Issues in Developing Wind Projects: Aesthetics**.** Presentation at the American Wind Energy Association Wind Power Siting Workshop, Portland, Oregon, October 13, 2004.

Addressing the Aesthetic Challenges Faced by the Wind Industry: Research to-Date and Insights from the Environmental Design Research Paradigm. Presentation at the Global WINDPOWER Conference, Chicago, March 31, 2004.

"The Environment Behavior Perspective and Assessment of Landscape Aesthetics - Powerline Siting and Analysis in North America." in Environment and Human Action, Proceedings, 8th International Conference of the IAPS, West Berlin, July 25-29, 1984. Berlin: Hochscule der Kunst, pp. 51-53. 1984.

Aesthetic Considerations and Electric Utilities: An Introductory Guide to the Literature. Palo Alto, CA: Electric Power Research Institute, February, 1984.

"The Field of Visual Analysis and Resource Management: A Bibliographic Analysis and Perspective" Landscape Journal. Spring, 1983, pp. 52-59.

Property Values

Electric Transmission Lines and Property Values—Proposal for a Program of Research. Presentation at the Edison Electric Institute/National Rural Electric Cooperative Association Siting Workshop, Burlington, Vermont, October 20, 2009.

Addressing Transmission Line and Wind Power Property Value Issues; Properly Informing the Public, Regulators, and Policy Makers. Invited Presentation to the 2008 Edison Electric Institute and National Rural Electric Cooperative Association Electric Facility Siting Workshop, Minneapolis, MN, October 7, 2008.

Transmission Lines and Property Values: Review of the Research and Summary of Key Findings: Report to the Emerging Technology Issues Advisory Committee of the Virginia General Assembly Joint Commission on Technology and Science. July, 2005.

The Effects of Overhead Transmission Lines on Property Values: A Review and Analysis of the Literature. (with Cynthia Kroll, Ph.D.) Prepared for the Siting and Environmental Planning Task Force of the Edison Electric Institute. 1992.

A Statistical Analysis of Transmission Line Impacts on Residential Property Values in Six Neighborhoods. (with Patrice Ignelzi) Prepared for the Southern California Edison Company. May, 1991.

A Guide to Assessing Transmission Line Impacts in Residential Communities. (with Patrice Ignelzi). Washington, DC, Edison Electric Institute, 1990.

Transmission Line Impacts: Studying Perceptions and Property Values. (videotape, contributing author of script). Washington, DC, Edison Electric Institute, 1990.

Public Perceptions of Electric Facilities

Public Perception of Electric Facilities, an Advanced Workshop, Washington, DC March 17, 18, 19, 1996: Workshop Summary (editor). Published by the Edison Electric Institute, Washington, DC, 1997.

Perception of Transmission Lines: Summary of Surveys and Framework for Further Research (with Kenneth Craik, Mary Deming, and Selma Monsky). International Electric Transmission Perception Project. Published by Edison Electric Institute, Washington, DC, 1996.

"Environmental Perception, Cognition, and Behavior: Public Responses to Electric Transmission Lines" (with Gary Evans, Ph.D.). Journal of Environmental Psychology 16, 65-74, March, 1996.

Public Perception of Electric Facilities, an Advanced Workshop, Washington, DC March 17, 18, 19, 1996: Workshop Summary (editor). Published by the Edison Electric Institute, Washington, DC, 1997.

Perception of Transmission Lines: Summary of Surveys and Framework for Further Research (with Kenneth Craik, Mary Deming, and Selma Monsky). International Electric Transmission Perception Project. Published by Edison Electric Institute, Washington, DC, 1996.

"Environmental Perception, Cognition, and Behavior: Public Responses to Electric Transmission Lines" (with Gary Evans, Ph.D.). Journal of Environmental Psychology 16, 65-74, March, 1996.

Perceived Effects of Electric Transmission Facilities: A Review of Survey-Based Studies. Prepared for the Siting and Environmental Planning Task Force of the Edison Electric Institute. 1992.

Perceptions of a Transmission Line in a Residential Neighborhood: Results of a Case Study in Vallejo, California. (With Gary Evans, Ph.D.) Prepared for the Southern California Edison Company. November, 1990.

Perceptions of a Transmission Line in a Residential Neighborhood: Results of a Case Study in Vallejo, California. (With Gary Evans, Ph.D.) Prepared for the Southern California Edison Company. November, 1990.

"Perceptions of Transmission Lines in Residential Neighborhoods: Results of a California Case Study." Edison Electric Institute Workshop on Transmission Lines in Residential Neighborhoods: Issues in Siting and Environmental Planning, Portland, Oregon, October, 1989.

Aesthetic Quality Issues and Their Treatment in Electric Transmission Line Planning - Towards a New Paradigm. Ph.D. Dissertation, Department of Landscape Architecture, University of California, Berkeley, September, 1988.

Issues Related to the Design of Electric Facilities to Improve their Integration into their Visual Settings

L' integration dans l'environnement des ouvrages de transport d'energie electrique. (in collaboration with Aménatech). Prepared for Hydro-Québec and Electricite de France. 1996.

Environmental Design Issues Associated with Older Substations. (with Aménatech). Report prepared for Hydro-Québec, Vice-présidence Environnement, October, 1995.

"The Public and Electric Facility Siting" (with Daniel Cohen). Article published in Environmental Planning Quarterly, Spring, 1995.

Substations in the Urban Context: Design Issues and Examples. Report prepared for Hydro-Québec, Vice-présidence Environnement, 1994.

Undergrounding of Electric Transmission Lines: A Review of Recent Cases in the United States. Prepared for Vice-présidence Environnement, Hydro Québec. July, 1990.

Supplemental Information

Years Experience Prior to CH2M HILL: 22
CH2M HILL Hire Date: 05/21/2001

Last Employee Update: 12/13/2010

Jerry Salamy

Senior Air Quality Task Lead

Education

B.A., Chemistry

Relevant Experience

Mr. Salamy has more than 22 years of experience, including assignments as Project Manager for numerous Applications for Certification (AFC) before the California Energy Commission (CEC). He has prepared numerous Prevention of Significant Deterioration Pre-Construction Air Quality Permit Applications, prepared project permitability studies, assessed industrial facilities compliance with state and federal air pollution rules and regulations, and assisted power plant clients with compliance-related issues.

Representative Projects

- **SolarReserve Rice Solar Energy Project.** Managed the preparation of the air quality permit and CEC license amendment Air Quality and Public Health sections for concentrating solar energy facility. The solar energy project included two diesel-fired emergency generators, two diesel-fired fire pumps, a wet surface air cooler, and energy storage commissioning facilities.
- **GWF Energy Tracy Combined Cycle Conversion Project, San Joaquin County, California.** Managed the preparation of the AFC, the air quality permit, and AFC Air Quality and Public Health sections for the conversion of an existing peaking plant to a combined-cycle baseload facility consisting of two natural-gas-fired turbines, fired heat recovery steam generators, steam turbine generator, and associated equipment.
- **Diamond Generating Mariposa Energy Project.** Managed the preparation of the air quality permit and CEC license amendment Air Quality and Public Health sections for a 200-megawatt peaking power plant. The peaking power plant included four natural gas-fired LM6000 PC combustion turbines, a diesel-fired emergency generator, and a diesel-fired fire pump.
- **GWF Energy Hanford and Henrietta Combined Cycle Conversion Projects.** Prepared the air quality permit and CEC license amendment Air Quality and Public Health sections for the conversion of two existing peaking plants to combined-cycle baseload facilities. The combined cycle facilities included two natural-gas-fired turbines, fired heat recovery steam generators, steam turbine generator, and associated equipment.

- **Chevron Richmond Power Plant Replacement Project.** Managed the preparation of the AFC, the air quality permit, and AFC Air Quality and Public Health sections for the replacement of steam generating equipment with a new combined cycled cogeneration facility at the Chevron Richmond Refinery. The Replacement project included a natural-gas-fired turbine, fired heat recovery steam generator, and associated equipment.

- **AES Highgrove Power Project.** Prepared the air quality permits and AFC for 300-megawatt peaking facility consisting of three natural-gas-fired turbines and associated equipment. The project will employ General Electric's LMS100 combustion turbine generators that integrate new technology to increase the combustion turbine's efficiency above existing turbine technologies.

- **City of Vernon Power Project.** Prepared the air quality permits and AFC for 914-megawatt baseload facility consisting of three natural-gas-fired turbines and associated equipment. The project would employ Siemen's Rapid Start combustion turbine generators that integrate new technology to decrease the facilities start up duration over existing turbine baseload technologies.

- **Power Plant Licensing and Permitting Program, Calpine Corporation.** Project Manager for several AFCs before the CEC for Calpine's **Delta Energy Center** in Contra Costa County, **East Altamont Energy Center** in Alameda County, **Los Esteros Critical Energy Facility** in Santa Clara County as well as AFCs for three peaking power plants licensed under the CEC's emergency AB970 licensing process. Managed multidisciplinary teams of scientists, planners, and engineers in preparing and filing the license applications, preparing Data Request Responses, attending workshops and providing expert testimony before the licensing hearings. Also prepared preconstruction monitoring plans and provided construction monitoring and compliance services.

- **Sutter Power Plant Application for Certification, Calpine Corporation, Yuba City, California.** Managed the preparation of the air quality section of Calpine Corporation's Sutter Power Plant AFC. The air quality analysis required the preparation of an environmental setting for the project site, a criteria and toxic pollutant emission inventory, a best available control technology analysis, and air dispersion modeling. These analyses were used to support the preparation of a Prevention of Significant Deterioration and New Source Review permit applications. These applications were submitted to the EPA's Region IX office and the Feather River Air Quality Management District for the issuance of a construction permits. The scope of work also required the identification of emission reduction credits (ERCs) to support the New Source Review permitting process.

Stephen Shaw

sgshaw77@comcast.net

Education

MS Engineering
University of California at Davis, September 1998
Thesis: An improved preliminary design methodology for high-lift systems for subsonic civil transport aircraft.

BS Aeronautical and Mechanical Engineering
University of California at Davis, June 1995

Professional Experience

October 2000 – present
Aeronautical Engineer, Boeing Commercial Airplane Group:
Aeronautical engineer in the high-speed configuration, product development group. Duties include providing drag estimates and drag polars for new, derivative, and competing aircraft. Emphasis on wing aerodynamic design and external aerodynamics. Experienced in wind tunnel test planning, execution, and post test data reduction and flight polar estimation.

October 1999 – October 2000
Aerospace engineer, TRW (Northrop Grumman):
Aerospace engineer for the Space and Missile Systems Division of TRW. Performed CFD analysis of ICBM type missiles. Duties consist primarily of simulation and applied CFD analysis, aerodynamic and aerothermal, for ICBM type missiles and derivatives in support of various launch and test programs. Also simulated solid propellant burn profiles and rocket staging environments.

July 1998 – October 1999
Aerospace engineer, TRW (Northrop Grumman):
Aerospace engineer for the Countermeasures Hands-On Program (CHOP), which is a program managed by the Ballistic Missile Technology Division of the Space and Missiles Technology Directorate at the Air Force Research Laboratory. CHOP provides fast, inexpensive hardware demonstrations of Third World countermeasures to U.S. theater missile defense (TMD) systems with the goal of supporting the development of a robust and effective U.S. TMD architecture. Lead aeronautical engineer for the Missile Feasibility Assessment program. Duties included aeronautical, aerothermal, and trajectory analysis. Other tasks performed included code development and modification, presentations to the customer, report writing, and providing analysis for other CHOP programs.

Publications

Van Dam, C.P., Shaw, S.G., Vander Kam, J.C., Brodeur, R.R., Rudolph, P.K.C., and Kinney, D., "Aero-mechanical Design Methodology for Subsonic Civil Transport High-Lift Systems", RTA Applied Vehicle Technology Panel Symposium on Aerodynamic Design and Optimization of Flight Vehicles in a Concurrent Multi-Disciplinary Environment, Ottowa, Canada, October 1999.

Van Dam, C.P., Shaw, S.G., Vander Kam, J.C., Rudolph, P.K.C, Kinney, D., "Aero-mechanical Design of High-Lift Systems", Aircraft Engineering and Aerospace Technology: An International Journal, Vol 71, No. 5, 1999.

HENRY JOHN SHIU

P.O. Box 4123
Davis, CA 95617
530.219.3110
hjshiu@sentaengineering.com

Employment

Consulting Engineer, Principal, *Senta Engineering, LLC*
2007 to present
Engineering consultation services on wind energy, other renewable energies, and aeronautics, with experience in rotor aerodynamics, grid integration, performance analysis, and field and lab testing.

Research Engineer, *University of California, Davis*
2002 to present
Engineering analysis of wind and marine hydrokinetic energies, with experience in rotor aerodynamics, performance analysis, grid integration, performance analysis, and field and lab testing. Collaborators include the California Energy Commission, U.S. Department of Energy, Sandia National Laboratories, National Renewable Energy Laboratory, California ISO, and Sacramento Municipal Utility District.

Education

2001, M.S., Mechanical and Aeronautical Engineering, University of California, Davis
Thesis: "Remote In-Flight Boundary Layer Visualization via Infrared Imaging"

1994, B.S., Mechanical and Aeronautical Engineering, University of California, Davis

Publications

Shiu, H., Milligan, M., Kirby, B., and Jackson, K., "California Renewables Portfolio Standard: Renewable Generation Integration Cost Analysis - Multi-Year Analysis Results and Recommendations", CEC-500-2006-064, 2006.

Van Dam, C.P., Shiu, H.J., Banks, D.W., Tracy, R.R., and Chase, J., "In-flight visualization of supersonic flow transition using infrared imaging", *Journal of Aircraft*, v. 39, no. 6, p 936-944, November/December 2002.

Andy Solberg, P.E.

Mechanical Engineer

Education

B.S., Mechanical Engineering
University of Nevada
Reno, NV

Certifications

Professional Engineer in Nevada, Oregon

LEED Accredited

Professional Societies

ASHRAE, Member

USGBC, Member

IEST, Technical Editor

Patents

Gas Diffusion Device (Patent No. US 7,597,617 B2)

Modulating Stack Cone (Pat. Pending)

Specialized Computer Skills

Flovent CFD

EnergyPlus

PV Watts

Solar Advisory Model

Background

Mr. Solberg is a mechanical engineer with CH2M HILL, and has over 15 years experience in mechanical system design and simulation. He leads the company's advanced design and simulation group. The group consists of a team of engineers who provide engineering modeling, simulation, visualization, testing, and design programming services for projects across the company's many business groups. His mission is to provide innovative solutions that create outstanding value to clients. Such solutions are derived and proven with the use of computer modeling technologies and visualization of technical information.

He is an expert in applied computational fluid dynamics (CFD). He has successfully used CFD airflow modeling to design and troubleshoot data centers, optimize cleanroom contamination control, improve indoor air quality in offices and factories, reduce the re-entrainment of fugitive exhaust gases into building air intakes, and optimize building aerodynamics. He has been successful in formulating, and applying, innovative sustainable design concepts such as natural and hybrid ventilation systems, earthtubes, solar towers, cool towers, wind towers and wind scoops. Mr. Solberg is also experienced with integrating renewable energy systems into buildings including integrated wind turbines, thermal solar systems, and photovoltaic solar systems for power. Mr. Solberg is committed to excellence in project team collaboration, innovation, and efficient project delivery methods.

Energy Master Planning and Energy Simulation

STAR PEAK ENERGY CENTER – Lovelock, Nevada

Project Manager/Project Engineer. Worked with the client Presco Energy in the development of the Star Peak Energy Center, a sustainable, carbon neutral renewable energy center (+100MW) and industrial park in Northern Nevada. The project includes a unique mix of assets, including a major transportation and utility corridor, water rights, nearly 12,000 acres of owned or leased surface rights, an existing geothermal plant, and undeveloped geothermal, solar and wind resources. Project responsibilities included the development of a comprehensive visioning document which detailed the site's assets, sustainability initiatives, and a balanced, scalable development of on-site energy uses and power production, with net export to the grid. Additional responsibilities included the design of a novel high-efficiency data center that was specifically designed to take advantage of site specific climate, as well as collect and reuse waste heat in co-located agriculture and biofuel industries. Work on the project continues with active promotion of the project to investors and

educators as an example of the "clean energy economy", and self-reliant regional economies.

CITY OF SAN FRANCISCO—San Francisco, California
Engineering Consultant. Performed wind resource assessment and analysis of the City's wind resource based on existing anemometer data. Established the framework for a wind resource layer on the City's Renewable Energy Map that would allow a city resident to type in their address and get an estimate of the energy derived from a small wind turbine located on their property.

CITY OF MASDAR—Masdar, United Arab Emirates
Engineering Consultant. Performed energy simulation and analysis to determine appropriate design strategies to reduce building energy use by 50% from typical Abu Dhabi energy use baselines. Estimated costs associated with design strategies for integration into the CH2M Voyage Model of Masdar, an all inclusive energy model that includes both vertical (buildings), and horizontal (water, wastewater, transportation) infrastructure.

CAPITAL DISTRICT—Abu Dhabi, United Arab Emirates
Engineering Consultant. Lead the team in the development of the Resourceful Energy Plan (REP) for the Capital District, a new planned city of over 300,000 permanent residents housing the central government of the United Arab Emirates. Responsibilities included reviewing Masterplan total energy demands for the city and establishing energy demand reduction targets and renewable energy production targets, as wells as establishing the associated strategies and technology to meet the goals.

ARMY CORPS OF ENGINEERS—Bradford Island Visitors Center
Engineering Consultant. Determined the site wind energy resource and worked with architects to integrated small wind turbines into the design of the Visitors Center.

Sustainable Building

COUNTY OF MAUI— Maui, Hawai'i
Mechanical Engineer. Responsibilities included the modeling of airflow at the County's central landfill site and the design a custom wind barrier that reduced winds at public dumping areas. Wind wall greatly reduces the risk to the public being struck by windblown debris during offloading. The wind barrier wall was also designed to have integrated wind turbines that would offset the majority of the County's energy costs at the landfill.

SEATAC RENTAL CAR FACILITY— Tacoma, Washington
Ventilation Modeling Program Management. Provided management

support services for a computational fluid dynamics modeling effort to verify ventilation requirements for the consolidated rental car facility. Responsibilities included a review and evaluation of modeling proposals, consultant selection, final scope definition, and review of work products.

RIVERWOODS LEARNING CENTER—Whitley County, Kentucky
Ventilation Consultant. New education center with classrooms cooled in the summer via earth cooling and passive ventilation techniques. Responsibilities included the design and modeling of earthtube performance and predicting resultant and temperatures achieved in the classrooms.

NIKE SUSTAINABLE FACTORY DESIGN—Vietnam
Mechanical Engineer. Responsibilities included the modeling of space airflow and temperature characteristics with natural and fan-assisted ventilation. Designed custom passive/active ventilation towers to maximize ventilation and airspeed at the working level of the facility. Project consisted of renovation of a single-story 100,000 ft^2 naturally ventilated factory building.

BRIGHTWATER WASTEWATER PLANT—Seattle, Washington
Mechanical Engineer. Responsibilities included the design and modeling of a natural and fan-assisted ventilation system, radiant heating system, and building integrated thermal solar system. Project consisted of a new LEED gold community and environmental education center.

DE LA SALLE CATHOLIC HIGH SCHOOL—Portland, Oregon
Ventilation Consultant. Responsibilities included the modeling of airflow and temperature characteristics within naturally ventilated classrooms during summer and winter design conditions. Tested the ventilation performance of various wind tower configurations, and determined wind tower design guidelines for the project. Project consisted of a two-story, private high school with wind tower enhanced natural ventilation for all classrooms.

FINGAL COUNTY COUNCIL OFFICE BUILDING—Dublin, Ireland
Mechanical Engineer. Responsibilities included the modeling of space airflow and temperature characteristics with natural and fan-assisted ventilation, and the determination of appropriate design modifications to meet or exceed the building's design criteria. Project consisted of a new four-story 40,000 ft^2 naturally ventilated office building.

HOOD RIVER LIBRARY—Hood River, Oregon
Ventilation Consultant. Responsibilities included the modeling of space airflow and temperature characteristics under natural ventilation modes of operation, and the determination of design modifications to

improve ventilation performance. Project consisted of a new addition to the historic library.

FALLINGWATER—Bear Run, Pennsylvania
Mechanical Engineer. Responsibilities included modeling of space airflow and temperature characteristics under natural ventilation. Determined the configuration of doors and windows as well as night ventilation strategies to enhance airflow through the house during peak summer temperatures. Project consisted of a thermal and airflow analysis of the historic Frank Lloyd Wright's Fallingwater.

Computing Centers and Data Centers

STANFORD UNIVERSITY—Palo Alto, California
Mechanical Engineer. Responsibilities included the development of a novel data center design concept that utilizes outside air for cooling the IT equipment throughout the year. Peak summer cooling was achieved with cooling towers only eliminating the need for chillers. Approximate energy savings to Stanford at full buildout is estimated to be 2.4 million dollars per year. Project consisted of conceptual basis of design and engineering for a new modular, scalable, highly energy efficient research computing center that serves Stanford University and Stanford Linear Accelerator Center researchers.

LOS ALAMOS NATIONAL LAB—Los Alamos, New Mexico
Data Center Consultant. Responsibilities included determining the Metropolis Center's ability to support and properly cool the Roadrunner supercomputer which consists of 288 14 kW racks operating at over 1 petaflops. Project consisted of airflow modeling and thermal analysis for the 45,000 ft^2 Nicholas Metropolis Center for Modeling and Simulation.

IBM CORPORATION—Raleigh, North Carolina
Mechanical Engineer. Responsibilities included airflow modeling and thermal analysis of the data center. Determined the required deign modifications necessary to support a mix of high density (>20kW/rack) and low density (<10 kW /rack) equipment in adjacent areas within the data center. Solutions included alternatives to water cooled racks potentially saving hundreds of thousands of dollars both capital and energy costs. Project consisted of new flagship 100,000 ft^2 highly energy efficient data center.

CONFIDENTIAL CLIENT—Hillsboro, Oregon
Mechanical Engineer. Project consisted of a new 20,000 ft^2 modular, scalable, high density (500 w/ft^2) computing data center. Design was first to incorporate hot aisle enclosures and implement a multiple level design.

Critical Environments

CONFIDENTIAL UNIVERSITY CLIENT—Southampton, UK
Mechanical Engineer. Responsibilities included airflow and thermal performance of naturally ventilated, and radiantly heated support spaces, and laboratory process exhaust dispersion. Project consisted of 100,000 ft² state-of-the-art Mountbatten research building which includes nanotech cleanrooms, research laboratories, and technical support space.

BP SOLAR—Madrid, Spain
Mechanical Engineer. Evaluated cleanroom airflow and thermal performance and optimized filter coverage and return air opening placement. Project consisted of conversion of a former microelectronics site into a 100,000 ft² state-of-the-art photovoltaic solar cell processing facility.

MISCELLANEOUS AIRFLOW MODELING CONSULTING PROJECTS
Site Airflow Consultant. Responsibilities included the creation of site airflow models to determine airflow patterns around buildings, and dilution of exhaust. Developed a state-of-the-art CFD modeling approach to identify and minimize exhaust re-entrainment within the built environment. Project consisted of multiple site airflow and exhaust characterization studies for multiple clients, including Alza, BP Solar, IBM, Medtronics, M+W Zander, Oregon Health & Science University, Portland State University, STMicroelectronics, Seagate, Starbucks, Texas Instruments, as well as confidential clients.

Cleanrooom Airflow Consultant. Responsibilities included the creation of airflow models of new and existing cleanrooms, as well as design recommendations to improve cleanroom airflow characteristics. Project consisted of multiple cleanroom airflow consulting projects for clients, including Alza, Bayer, Hewlett-Packard, M+W Zander, Motorola, Micron, STMicroelectronics, IBM, Infineon, Seagate, as well as confidential clients.

Laboratory Airflow Consultant. Optimized airflow patterns within laboratories using CFD for the clients such as Aketon Technologies, Emory University, Molecular Probes, and confidential clients. Project consisted of lab airflow design.

HEWLETT-PACKARD—Fort Collins, Colorado
Mechanical Engineer. Responsibilities included calculation and management of HVAC loads as well as hydraulic modeling and analysis of all mechanical systems (chilled water, glycol chilled water, heating water, condenser water, and fuel oil systems) using hydraulic

modeling software. Project consisted of a 365,000 ft² submicron semiconductor manufacturing facility.

HEWLETT-PACKARD, BUILDING 3—Corvallis, Oregon
Mechanical Systems Engineer. Responsibilities included ongoing engineering support of all mechanical systems in Building 3 which housed three Class 10 cleanrooms. Modeled existing chilled water plant, and created detailed documentation and capacity forecasts of critical mechanical systems. Project consisted of a staff augmentation.

MOTOROLA, INC.—Tianjin, People's Republic of China
Mechanical Engineer. Responsibilities included steam pipe stress modeling and the hydraulic modeling and analysis of all mechanical systems (chilled water, glycol chilled water, heating water, condenser water, and fuel oil systems) using hydraulic modeling software. Project consisted of greenfield design of a 310,000 ft² submicron microelectronics manufacturing facility with a 34,500 ft² cleanroom.

Selected Presentations/Publications

Portland Oregon
Star Peak Energy Center – Renewable Energy for Industry
Northwest Environmental Conference Winter 09

San Francisco, California
Stanford Research Computing Facility – An Economized Data Center, Data Center Dynamics Conference Summer 08

Boca Raton, Florida
Economize the Data Center – Applying CFD Airflow Modeling to the External Environment. 7X24 Exchange Conference Spring 08

Reno, Nevada
Incorporating Green Ventilation Design into Building Projects, Sustainable Development Conference Presentation

Bend, Oregon
Using CFD to enhance Cleanrooms and Operating Theatres, Oregon Society of Healthcare Engineering Conference Presentation

Santa Clara, California
Airflow Modeling Applications in the Microelectronics and Pharmaceutical Industries, Flovent Airflow Modeling Seminar Presentation

"Economizer Performance: Applying CFD Modeling to the Data Center's Exterior" Tech Target Data Center Media, April 28, 2008, co-author.

"Analysis of Numerical Models for Dispersion of Chemical/Biological Agents in Complex Building Environments", US Army Corps of Engineers Engineer Research and Development Center, November 1, 2004, co-author.

"Simulation Helps Meet Thermal Challenges of One of the World's Fastest Supercomputers:" Data Center Journal, March 18, 2008, interviewee.

"Cleanrooms 2013", Cleanrooms Magazine August 1, 2003 interviewee.

"Enhancing Cleanroom Design with Airflow Modeling", Cleanrooms Magazine, April 1, 2002, co-author.

W. Geoffrey Spaulding

Paleontological Resources Specialist

Education

Ph.D., Geology (Paleobiology), University of Arizona, 1981

M. S., Geology (Palynology & Vertebrate Paleobiology), University of Arizona, 1974

B. A., Anthropology (Archaeology), University of Arizona, 1972

Certifications

Nevada State Bureau of Land Management Paleontological Resources Use Permit N-82749

California State Bureau of Land Management Paleontological Resources Use Permit CA-07-17

Approved Paleontological Resources Specialist by the California Energy Commission, State of California

Reviewed under Secretary of the Interior's Guidelines by the California Energy Commission, State of California and Approved as a Geoarchaeologist

Qualifications as Paleontological Resources Expert Witness accepted by the Attorney General of the State of Washington

Distinguishing Qualifications

- Specialist in Paleontological Resources Management
- Expert in the Quaternary Paleoecology and Paleoclimatology of Western North America
- Specialist in Site Formation Processes, Quaternary Paleobiology, Geoarchaeology, Paleohydrology
- Captain, Signal Corps, United States Army Reserve (Retired)

Relevant Experience

Dr. Spaulding is a senior technical lead and paleontologist with CH2M HILL, with extensive experience in experience in paleobiology, paleontology, and paleoecology. He also is accomplished in the study of site formation processes, and the Quaternary geology of the western United States. He has more than three decades of technical experience in the Earth and Life sciences focusing on the deserts of western North America and on California. Prior to joining private industry, he was on the research faculty of the University of Washington, Seattle, pursuing research in the paleobiology and paleoecology of the American West.

Paleontological Resources Management

California Bureau of Land Management Jurisdiction

Ivanpah Solar Energy Generation Station EIS/AFC. 2007 - 2010. Conduct records review and literature search, field reconnaissance and subsequent pedestrian field survey of paleontologically sensitive areas, and recordation of Paleozoic and Quaternary paleontological sites, in support of a large solar powered electrical generation facility. Model pluvial lake fluctuations and alluvial fan surface development to determine distribution of paleontologically and archaeologically sensitive sediments. Prepare appropriate Paleontological Resources sections for BLM EIS and California Energy Commission Application for Certification. Address site formation process in subsequent data request phase. Prepare the agency-approved Paleontological Resources Monitoring and Mitigation Program for the project.

Los Angeles Department of Water and Power, Mead/McCullough - Victorville/Adelanto Transmission Line. 1994 - 1995. Manage cultural and paleontological resources monitoring and mitigation in conjunction with the construction of a 500 kV power line extending through Nevada and California. Assess levels of significance of paleontological sites discovered during survey and monitoring, implement mitigation measures for affected sites, manage analyses, prepare reports.

Other Jurisdictions

Preparation of Paleontological Resources Assessments for Applications for Certification to the California Energy Commission for Multiple Power Generation Projects. Prepare resource specific documentation for more than 25 separate projects. Conduct literature reviews, records searches, and field surveys to develop Paleontological Resources Assessments, prepare paleontological resources impact evaluations and mitigation measures, for projects' Application for Certification before the California Energy Commission. Determine the relative levels of paleontological sensitivity of Mesozoic through Quaternary rock units in the context of the geological history of the project areas, direct field surveys, and prepare AFC sections for projects from San Diego in the south to Humboldt Bay in the north. Prepare Paleontological Resources Monitoring and Mitigation Plans for construction-phase compliance activities.

Paleontological Resources Specialist, Construction-Phase Mitigation Implementation, Multiple Power Generation Projects, California. Develop and manage paleontological resources monitoring and mitigation programs for the construction of power generation projects including the following:

- Highgrove and Sunshine Energy Centers in western Riverside County
- Carlsbad and South Bay Energy Centers in San Diego County
- Canyon Power Plant Project, Santa Ana
- Blackrock Unit 6 on the Salton Sea
- Walnut and Almond 2 Energy Centers south of Modesto
- Roseville Energy Park east of Sacramento
- Gateway Generation Station near Antioch

- Colusa Generation Station south of Willows
- Humboldt Bay Repowering Project near Eureka
- Los Medanos Energy Center, Pittsburg, CA
- Russell City Energy Center near Hayward

As part of these efforts he was responsible for the preparation of the Paleontological Resources Module of the worker education program and visual aids for worker education. He directes the recovery of discovered paleontological resources (Quaternary vertebrate and paleobotanical remains), and consults with state and federal agency staff on the design and implementation of mitigation plans. He develops site-specific stratigraphic framework to identify paleontologically sensitive sediments, and to provides the client and agencies with guidance regarding what construction activities need and need not be monitored.

Salton Sea Ecosystem Restoration Project EIR. Geological and paleontological literature review, records search including consultations with California State Paleontologist, to develop large scale paleontological sensitivity assessment of the Salton Trough. Develop impact assessment and mitigation measures for Environmental Impact Report. Develop mitigation measures for eight different action alternatives, and respond to comments on the PEIR.

Paleontological Resources Assessment for Kinder Morgan's EPX Pipeline, Texas, New Mexico, and Arizona. Literature and records review, remote-sensing and map analyses to characterize the affected environment and environmental impacts for a Bureau of Land Management Environmental Assessment for the installation of an interstate petroleum products pipeline. Prepare appropriate sections of the EA, and assemble technical information from museums in three states.

Transportation-Related Paleontological Resources Management Services, southern California. Perform paleontological resources assessments, develop management and monitoring plans, prepare, review and amend subconsultant scopes of work, and provide audit services to clients for paleontological resources management work. Multiple contracts for the City of San Diego, the Regional Transportation Commission, and the Counties of Riverside, San Diego and Orange. Formations addressed included Quaternary terrestrial and lacustrine units, and Tertiary marine and estuarine sediments.

Client Task Oversight & Expert Witness Testimony on Paleontological Resources Sensitivity. Review and develop discovery and mitigation plans, and provide testimony to the Attorney General of the State of Washington. On the paleontological data potential and impacts to Middle Tertiary age fossil resources in the Columbia Basin, and on potential project-related impacts pursuant to Washington's Energy Facility Siting & Environmental Certification process, on behalf of Olympic Pipeline Corporation.

Duke Energy of North America, Paleontological Support Services for the Potrero and Contra Costa Applications For Certification. Conduct literature reviews, record searches, and site surveys; and prepare appropriate sections of Applications for Certification according to the format and data requirements of the California Energy Commission. Respond to CEC staff questions and requests for additional data. Provide cost-control strategies to client. In support of the relicensing efforts for two power plants in the Bay Area of California.

Selected Publications

2008 - A Late Holocene Record of Vegetation and Climate from a Small Wetland In Shasta County, California. (with R. S. Anderson, S. J. Smith, and R. B. Jass. *Madroño* 55 (1): 15–25.
2004 - Development of Vegetation in the Central Mojave Desert of California during the Late Quaternary. (with P. A. Koehler and R. S. Anderson). *Palaeogeography, Palaeoclimatology, Palaeoecology* 215:297-311.
2001 – Ploidy Race Distributions since the Last Glacial Maximum in the North American Desert Shrub, *Larrea tridentata* (with K.L. Hunter, J.L. Betancourt, B.R. Riddle, T.R. Van Devender, and K.L. Cole). *Global Ecology & Biogeography* 10: 521-533.
2000 – A Molecular Analysis of Ground Sloth Diet through the Last Glaciation (with M. Hofreiter, H. N. Poinar, K. Bauer, P.S. Martin, G. Possnert, and S. Paabo). *Molecular Ecology* 9: 1975-1984.
1999 - Middle to Late Quaternary Climatic Changes in Death Valley and Vicinity. In *Proceedings of Conference on Status of Geologic Research and Mapping in Death Valley National Park*. U.S. Geological Survey Open-File Report 99-153, pp. 121-124.
1999 - Environmental Imperatives Reconsidered: Demographic Crises in Western North America During The Medieval Climatic Anomaly (with T. L. Jones, G. M. Brown, L. M. Raab, J. L. McVickar, D. J. Kennett, A. L. York, and P. L. Walker). *Current Anthropology* 40(2): 137-170.
1998 - Molecular coproscopy: dung and diet of the extinct Shasta ground sloth *Nothrotheriops shastensis* (with H. Poinar, M. Hoffreiter, P. S. Martin, and S. Paabo). *Science* 281: 402-406.
1996 - Paleobiotic and isotopic analysis of mollusks, fish, and plants from Core OL-92: Indicators for an open or closed lake system (with J. R. Firby, S. E. Sharpe, J. F. Whelan, and G. R. Smith). In *An 800,000-year paleoclimatic record from Owens Lake, California*, edited by G. I. Smith and J. L. Bischoff, pp. 143-160. Geological Society of America Special Paper 317.
1995 - Environmental change, ecosystem responses, and the Late Quaternary development of the Mojave Desert. In *Quaternary Environments and Deep Time: Papers in Honor of Paul S. Martin* (D. S. Steadman and J. I. Mead, eds.), pp 225-256. Fenske Printing, Inc., Rapid City, South Dakota.
1995 - Pika (*Ochotona*) and the Late Quaternary paleoecology of the Great Basin (with J. I. Mead). In *Quaternary Environments and Deep Time: Papers in Honor of Paul S. Martin* (D. S. Steadman and J. I. Mead, eds.), pp 257-283. Fenske Printing, Inc., Rapid City, South Dakota.
1993 - Climatic changes in the western United States since 18,000 yr. B.P. (with R. S. Thompson, C. Whitlock, P. J. Bartlein, and S. P. Harrison) In *Global climates since the last glacial maximum*, edited by H. E. Wright, Jr., J. E. Kutzbach, T. Webb, III, W. F. Ruddiman, F. A. Street-Perott, and P. J. Bartlein, pp. 468-513. University of Minnesota Press, Minneapolis.
1992 - An alternative perspective on Mojave Desert prehistory (with J. H. Cleland). *Society for California Archaeology Newsletter* 26: 1-6.
1992 - *Ground water at Yucca Mountain: How high can it rise?* (with members of the NAS, NRC Panel on Coupled Hydrologic/Tectonic/Hydrothermal Processes at Yucca Mountain). National Academy Press, Washington, D.C.
1992 - Ecological characterization of fossil plants (with S. J. Mazer, T. L. Phillips, R. E. Taggert, and B. H. Tiffney). In *Terrestrial ecosystems through time: Evolutionary paleoecology of terrestrial plants and animals*, edited by A.K. Behrensmeyer *et al.*, pp. 139-180. University of Chicago Press.
1992 - Late Cenozoic terrestrial ecosystems (with R. E. Taggart, J. A. Harris, B. Van Valkenberg, L. D. Martin, J. D. Damuth, and R. Foley). In *Terrestrial ecosystems through time: Evolutionary*

paleoecology of terrestrial plants and animals, edited by A. K. Behrensmeyer *et al*., pp. 419-541. University of Chicago Press.
1992 - Glacial/Interglacial 13C/12C ratios of atmospheric CO2 inferred from carbon in C4 plant cellulose (with B. D. Marino, M. B. McElroy, and R. J. Salawitch). *Nature* 357: 461-466.
1991 - A middle Holocene vegetation record from the Mojave Desert and its paleoclimatic significance. *Quaternary Research* 35: 427-437.
1991 - Pluvial climatic episodes in North America and North Africa: Types and correlation with global climate. *Palaeogeography, Palaeoclimatology, Palaeoecology* 84: 217-227.
1991 - Comparison of pollen and macrofossil based reconstructions of Late Quaternary vegetation in western North America. In *Proceedings of the 7th International Palynological Congress, Brisbane, Australia*, edited by E. M. Truswell and J. A. K. Owen, pp. 359-366. Elsevier, Amsterdam.
1990 - Packrat middens: Their composition and methods of analysis (with K. L. Cole, J. L. Betancourt and L. K. Croft. In *Packrat middens: The last 40,000 years of biotic change*, edited by J. L. Betancourt, P. S. Martin, and T. R. Van Devender, pp. 59-84. University of Arizona Press, Tucson.
1990 - Environments of the last 50,000 years in the vicinity of Yucca Mountain, central-southern Nevada. *High Level Radioactive Waste Management* 2: 1251-1258.
1990 - Vegetation dynamics during the last deglaciation, southeastern Great Basin, U.S.A. *Quaternary Research* 33: 188-203 (1990).
1990 - Vegetational and climatic development of the Mojave Desert: The last glacial maximum to the present. In *Packrat middens: The last 40,000 years of biotic change*, edited by J. L. Betancourt, P. S. Martin, and T. R. Van Devender, pp. 166-199. University of Arizona Press, Tucson.
1988 - Climatic changes of the last 18,000 years: Observations and model simulations (with COHMAP Project Members). *Science* 241: 1043-1052.
1986 - The last pluvial climatic episodes in the deserts of southwestern North America (with L. J. Graumlich). *Nature* 320:441-444.
1985 - *Vegetation and Climates of the last 45,000 years in the vicinity of the Nevada Test Site, south-central Nevada*. U. S. Geological Survey Professional Paper No. 1329. Denver, CO.
1983 - Late Wisconsin paleoecology of the American southwest (with E. B. Leopold and T. R. Van Devender). In *The late Pleistocene of the United States*, edited by S.C. Porter, pp. 259-293. University of Minnesota Press, Minneapolis.
1983 - Late Wisconsin macrofossil records of desert vegetation in the American southwest. *Quaternary Research* 19: 256-264.
1979 - Development of vegetation and climate in the western United States (with T. R. Van Devender). *Science* 204: 701-710.

Doug Urry

Project Description, Hazardous Materials, Traffic and Transportation – Aviation, Waste Management, Worker Health and Safety, Alternatives

Education

M.S., Civil and Environmental Engineering, University of Washington, 1999
B.S., Environmental Engineering, California Polytechnic State University, San Luis Obispo, 1992

Relevant Experience

Mr. Urry has over eighteen years of environmental management and regulatory compliance experience, including nine years of experience providing permitting and compliance support for power generation facilities. Mr. Urry's background includes multimedia environmental compliance and permitting, energy development siting and licensing, property acquisition due diligence, remediation, hazardous materials/hazardous waste management, and industrial hygiene.

Representative Projects

Mariposa Energy Project; Diamond Generating Corporation; Alameda County, California. 2008 - present. Project Manager for the licensing of this 200-MW simple cycle power plant. Managed a multidisciplinary team of scientists, planners, and engineers in preparing and filing the license application. Coordinated efforts between CEC project management, local and state agencies and CH2M HILL staff. In addition to overseeing the preparation of the AFC, Mr. Urry prepared the Project Description, Electrical Transmission, Natural Gas Supply, Worker Health and Safety, Alternatives Analysis, and Executive Summary sections.

Humboldt Bay Generating Station; Pacific Gas & Electric; Eureka, CA. 2008 – present. Project Manager for CEC compliance support contract for construction of this power generation facility. Providing management and coordination for cultural and paleontological resources monitoring programs. Managed development of various regulatory compliance programs and plans including hazardous materials programs (HMBP, RMP, Security and Vulnerability Assessment), Historic Resources Mitigation program, storm water (SWPPP), Waste Management Plan. Prepared a Petition for Modification for the addition of an off-site construction laydown area assessing potential environmental impacts associated with this project change.

Roseville Energy Park; Roseville Electric; Roseville, CA. 2003 – 2007. Assistant Project Manager for this CEC licensing project. Provided regulatory consulting, permit development, and compliance plan development throughout all phases of this 160 mega-watt combined cycle power plant permitting and construction project. Responsible for technical oversight and review of EH&S aspects of California Energy Commission (CEC) Application for Certification (AFC). Developed facility operations compliance plans/permits including RMP, SWPPP, and HMBP.

Donald Von Raesfeld Power Project; Silicon Valley Power; Santa Clara, CA. 2002 – 2005. Assistant Project Manager for the licensing of this 147-MW combined cycle power plant. Provided regulatory consulting, permit development, and compliance plan development throughout all phases permitting and construction. Responsible for technical oversight and review of EH&S aspects of CEC Application, project coordination, and regulatory agency interface. Managed Phase I and Phase II Environmental Site Assessments for proposed project sites. Managed multiple construction regulatory compliance tasks including contaminated soil characterization and remediation, SWPPP compliance plan development and implementation, and Federal Aviation Administration hazard determinations. Developed facility operations compliance plans/permits including RMP, SPCC, SWPPP, HMBP, and POTW wastewater discharge permitting.

Russell City Energy Center; Calpine Corporation; Hayward, CA. 2001 – 2004. Served as Assistant Project Manager, responsible for project coordination, technical review, client communication, and regulatory agency interface. Managed technical specialists in completing the application document and resolving technical issues. Participated in public meetings to communicate technical project information to CEC staff and public. Prepared hazardous materials and waste management technical sections for the application. Coordinated with the City of Hayward on land use planning, traffic, stormwater, and hazardous material issues. Coordinated with Department of Toxic Substances Control and Alameda County Department of Flood Control to ensure compliance of hazardous waste disposal and stormwater release plans.

Power Plant Development Projects; Northern California. 2001 – 2005. Supported several CEC power plant AFC projects with project management, regulatory, and technical support throughout permitting, construction, and operational start-up phases. Managed several pre-permitting fatal flaws studies and for power plant site selection. Also managed various CEQA projects (Initial Studies and various discrete technical reports) and Phase I ESAs for several power plant development projects. Managed and performed power plant construction and operations compliance program development including hazardous materials (HMBP, SPCC, and RMP), storm water, and noise compliance testing programs.

Generation Facility Compliance Program Development; Orion Power Holdings; New York, NY. 1999. Developed comprehensive multi-media environmental compliance program for three generating facilities following acquisition by Orion. Prepared detailed explanation and schedule for compliance requirements to assist management and plant operators in executing compliance activities following their transition.

Emissions Testing Program; Southern California Edison; Southern California facilities. 1992 – 1996. Managed and executed source test programs for utility boiler combustion optimization, nitrogen oxides (NOx) emission reduction system optimization, and to demonstrate compliance with South Coast AQMD operating permit limits for nitrogen oxides, carbon monoxide, hydrocarbons, ammonia, and particulate. Performed on-site ammonia analysis with immediate results reporting enabling rapid optimization of selective catalytic reduction and urea injection NOx emission control systems. Managed field crews for test programs and prepared compliance plans and reports for agency submittal.

December 2010

C. P. (Case) van Dam

Department of Mechanical and Aerospace Engineering
University of California, Davis
One Shields Avenue
Davis, CA 95616-5294

tel:	(530) 752-7741 (direct)
	(530) 752-0580 (department)
	(530) 219-3095 (cell)
fax:	(530) 752-4158
e-mail:	cpvandam@ucdavis.edu
www:	http://flight.engr.ucdavis.edu/~cvandam

Education

Doctor of Engineering in Aerospace Engineering, University of Kansas, Lawrence, Kansas, May 1983.

Master of Science in Aerospace Engineering, Delft University of Technology, Delft, The Netherlands, August 1979.

Master of Science in Aerospace Engineering, University of Kansas, October 1978.

Bachelor of Science in Aerospace Engineering, Delft University of Technology, September 1975.

Experience

July 2010 - Present
Chair, Department of Mechanical and Aerospace Engineering
Warren and Leta Giedt Endowed Professor

February 2002 - Present
Director of the California Wind Energy Collaborative; a partnership between the University of California and the California Energy Commission

July 1985 - Present
Assistant Professor (July 1985 - June 1989), Associate Professor (July 1989 - June 1995) and Professor (July 1995 - Present) in the Department of Mechanical and Aeronautical Engineering of the University of California, Davis. Teaching the capstone aircraft preliminary design course as well as course in aerodynamic design and optimization, wind tunnel experimentation, and wind power engineering. Also teaches industry short courses on aircraft aerodynamic performance improvement techniques and wind energy. Conducting research in wind energy engineering, aerodynamic drag prediction and reduction, high-lift aerodynamics, and active control of aerodynamic loads. Consultant for aircraft, wind energy, and sailing yacht manufacturers and serving on review committees for government agencies and research organizations.

April - July 1992 & June - December 1993
Visiting Researcher at NASA Langley Research Center conducting research on high-lift aerodynamics in support of Subsonic Aircraft High-Lift Flight Project.

January 1984 - August 1985
Research Associate, Vigyan Research Associates, Inc., Hampton, Virginia. Worked on the design and optimization of advanced technology lifting systems with special emphasis on cruise drag and high-angle of-attack (stall/spin) lift characteristics. Also studied the shaping of airplane fuselages for minimum drag.

January - December 1983
NRC Postdoctorate at NASA Langley Research Center. Investigated the possibilities for and the potential benefits of extensive amounts of natural laminar flow on devices such as wingtip-mounted winglets.

September 1979 - August 1982
Research Associate of the University of Kansas assigned to the Low-Speed Aerodynamics Division at NASA Langley Research Center. As a member of the Aerial Applications Research Project conducted theoretical and experimental analyses on the effects of wingtip modifications on airplane performance, stability and control, handling qualities, and aerodynamic loading.

September 1978 - August 1979
Research Assistant and Project Manager at the University of Kansas Flight Research Laboratory in charge of NASA research project. Correlated theoretical predictions of longitudinal aerodynamic characteristics with wind-tunnel data on the ATLIT airplane.

August 1977 - August 1978
Research Assistant and Project Manager at the University of Kansas Flight Research Laboratory. Worked on a research program supported under a NASA grant on the reduction of interior noise in general aviation airplanes.

August - September 1976
El Al Israel Airlines Ltd. (Tel-Aviv, Israel). Investigated airplane propulsion problems with the Engineering Department during a two-month internship.

June - August 1975
KLM Royal Airlines (Amsterdam, The Netherlands). Two-month internship with the Engineering Department investigating the deterioration in DC-8 fuel consumption.

Honors and Fellowships

- Warren and Leta Giedt Endowed Professorship, July 2010.
- Elected to Honor Roll of Department of Aerospace Engineering, University of Kansas, April 2010.
- Elected AIAA Associate Fellow, September 2007.
- U.S. Department of Energy award for "Outstanding Research and Development Partnership to Advance Wind Energy Technology" in partnership with Knight & Carver, and Sandia National Laboratories, May 2006.
- AIAA Fluids 2000 Art of Flow Control Artistic Award for Active Load Control and Lift Enhancement using MEM Translational Tabs, June 2000.
- NASA Certificate of Recognition for work on In-Flight Infrared Surface Flow Visualization, October 1998.
- NASA-ASEE Summer Faculty Fellowship Awards, 1993 and 1994.
- NASA Certificate of Recognition for the development of Crescent Wing Planforms, December 1989.
- AIAA Lawrence Sperry Award for major innovative contributions in Applied Aerodynamics, 1989.
- NASA Certificate of Recognition for the development of an Aircraft Stall-Spin Entry Deterrent System, March 1988.
- Outstanding Advisor Award of the University of California, Davis, School of Engineering, 1985 - 1986.
- Group Achievement Award, Aerial Applications Research Team, NASA Langley Research Center, October 1983.
- National Research Council Postdoctoral Research Associateship Award, 1983.
- Member of Sigma Gamma Tau (National Honor Society in Aerospace Engineering).

Professional Activities

- Organizer and Chair of 7th California Wind Energy Collaborative Forum, UC Davis, CA, May 10, 2010.
- Organizer and Chair of 6th California Wind Energy Collaborative Forum, UC Davis, CA, March 4, 2009.
- Organizer and Chair of Small Wind Workshop, UC Davis, CA, October 29, 2008.
- Invited international member of faculty search committee in Sustainable Energy at École Polytechnique de Fédérale Lausanne (EPFL), June – December 2007.
- Chair and Organizer of session on Rotor Aerodynamics and Aeroacoustics at the AWEA Windpower 2007 Conference and Exhibition, Los Angeles, CA, June 2007.
- Member of the Editorial Board of the journal Wind Energy, February 2007 – present.
- Served on NSF review panel Energy for Sustainability, April 2007.
- Chair and Organizer of session on Aerodynamics and Aeroacoustics at the 2007 ASME Wind Energy Symposium / 45th AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, January 2007.
- Organizer and Chair of 5th California Wind Energy Collaborative Forum, Napa, CA, December 12-13, 2006.
- Organizer and Chair of 4th California Wind Energy Collaborative Forum, La Jolla, CA, December 13-14, 2005.
- Chair and Organizer of session on Blade and Rotor Aerodynamics at the 2005 ASME Wind Energy Symposium / 43th AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, January 2005.
- Organizer and Chair of 3rd California Wind Energy Collaborative Forum, Palm Springs, CA, December 14-15, 2004.
- Invited member of Peer Review Panel to evaluate NASA research on Basic Aerodynamics, Langley Research Center, Hampton, VA, January 27-29, 2004.
- Associated Editor of Wind Energy for the international journal Solar Energy, Aug 2003 – July 2004.
- Organizer and Chair of 2nd California Wind Energy Collaborative Forum, UC Davis, December 16-17, 2003.
- Invited Co-Director of Von Karman Institute for Fluid Dynamics Lecture Series on CFD-Based Aircraft Drag Prediction And Reduction, Rhode Saint Genèse, Belgium, February 3-7, 2003.
- Chair and Organizer of session on Wind Turbine Aerodynamics at the 2003 ASME Wind Energy Symposium / 41th AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, January 2003.
- Organizer and Chair of 1st California Wind Energy Consortium Forum, UC Davis, December 17-18, 2002.
- Invited member of Peer Review Panel to evaluate NASA research on High-Lift Aerodynamics, Langley Research Center, Hampton, VA, November 16-18, 1999.
- Invited member of Science Panel to review test of NREL research wind turbine in the NASA Ames 80' x 120' wind tunnel, Boulder, CO, Oct. 5-6, 1998.
- Chaired Session on Shock Waves at the 8th International Symposium on Flow Visualization, Sorrento, Italy, Sept. 1-4, 1998.
- Chaired Session on High Speed Imaging at the 7th International Symposium on Flow Visualization, Seattle, WA, Sept. 11-14, 1995.
- Member of AIAA Applied Aerodynamics Technical Committee, 1993-95.
- Co-edited book titled Fluid Dynamics in Biology, Contemporary Mathematics, Vol. 141, 1993.
- Chaired Session on Airfoil/Wing Aerodynamics at the AIAA 31st Aerospace Sciences Meeting, Reno, NV, January 1993.
- Chaired Panel Discussion on Design/Optimization Methodology at the NASA Computational Aerosciences Conference, NASA Ames Research Center, August 18-20, 1992.
- Chaired Panel Discussion entitled "CFD versus Wind Tunnels?" at the 4th International Symposium on CFD, UC Davis, Davis, CA, September 9-12, 1991.
- Organized and co-chaired the AMS/IMS/SIAM Joint Summer Research Conference on Biofluiddynamics, University of Washington, Seattle, WA, July 6-12, 1991.
- Reviewer for Journal of Aircraft, AIAA Journal, Journal of Computational Physics, Wind Energy and many other journals.

Academic Courses Taught

- Undergraduate:

EAE-125	Aeronautical Engineering Fundamentals
EAE-127	Applied Aircraft Aerodynamics
EAE-128	Aircraft Performance
EAE-130	Aircraft Preliminary Design
ENG-103	Fluid Dynamics
EME-184	Mechanical Engineering Design Project
ENG-107L	Thermal Fluids Laboratory
EAE-130A&B	Aircraft Performance and Design

- Graduate:

EAE-232	Advanced Aerodynamics - Viscous Flow
EAE-238	Advanced Aerodynamic Design and Optimization
ME-270	Aerodynamics of Flight Vehicles (GWU-JIAFS, Fall 1993)
MAE-266	Advanced Wind Tunnel Testing
MAE-268	Wind Power Engineering

Short Courses Taught

- Applied Aerodynamic Drag Reduction
  Williamsburg, VA; March 18-23, 1991 (2 hrs)
  Williamsburg, VA; March 9-13, 1992 (5 hrs)
  Williamsburg, VA; March 22-26, 1993 (6 hrs)

- Aerodynamic Drag Reduction - Fundamentals and Applications
  Williamsburg, VA; March 20-23, 1995 (6 hrs)
  San Diego, CA; September 16-19, 1996 (7 hrs)
  Lawrence, KS; June 17-20, 1997 (7 hrs)

- High-Lift Systems and Aerodynamics for General Aviation and Subsonic Transport Aircraft
  Lawrence, KS; September 16-19, 1996 (5 hrs)
  NASA Ames Research Center, CA; October 15-17, 1996 (8 hrs)
  San Diego, CA; September 10-12, 1997 (8 hrs)
  Lawrence, KS; October 14-16, 1998 (8 hrs)

- Aerodynamic Design Improvements: High-Lift Systems and Cruise Performance
  Lawrence, KS; July 10-14, 2000 (15 hrs)
  Williamsburg, VA; March 19-23, 2001 (15 hrs)
  Seattle, WA; April 15-19, 2002 (15 hrs)
  Williamsburg, VA; March 10-14, 2003 (15 hrs)
  San Diego, CA; September 21-24, 2004 (12 hrs)
  Seattle, WA; April 18-22, 2005 (15 hrs)
  Orlando, FL; October 30-November 3, 2006 (15 hrs)
  Lockheed Martin, Palmdale, CA; January 29-February 2, 2007 (30 hrs)
  San Diego, CA; September 11-15, 2007 (15 hrs)
  Lockheed Martin, Marietta, GA; January 28-February 1, 2008 (30 hrs)
  Orlando, FL; November 17-21, 2008 (15 hrs)
  San Diego, CA; September 13-17, 2010 (15 hrs)

- Wind Energy for Technicians
  Livermore, CA; March 25-26, 2006 (2 hrs)

Palm Desert, CA; January 27-28, 2007 (3 hrs)
Palmdale, CA; October 18-19, 2008 (3 hrs)

- Small Wind Energy Systems

  UC Davis, CA; April 28-29, 2006 (2 hrs)
  UC Davis, CA; November 18, 2006 (2 hrs)
  UC Davis, CA; April 28, 2007 (3 hrs)
  Sacramento, CA; April 25, 2009 (4 hrs)

Publications

Papers and Books Published

1978 1. SOME NOISE TRANSMISSION LOSS CHARACTERISTICS OF TYPICAL GENERAL AVIATION STRUCTURAL MATERIALS,
J. Roskam, C. P. van Dam, and F. Grosveld, AIAA Aircraft Systems and Technology Conference, AIAA Paper 78-1480, Los Angeles, CA, August 21-23, 1978.

1980 2a. CORRELATION OF PREDICTED LONGITUDINAL AERODYNAMIC CHARACTERISTICS WITH FULL-SCALE-WING TUNNEL DATA ON THE ATLIT AIRPLANE,
J. Roskam, C. P. van Dam, and M. Griswold, AIAA 18th Aerospace Sciences Meeting, AIAA Paper 80-0186, Pasadena, CA, January 14-16, 1980.

2b. LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF THE ATLIT AIRPLANE,
J. Roskam, C. P. van Dam, and M. Griswold, Journal of Aircraft, Vol. 18, No. 6, June 1981, 495-496. (AIAA Paper 80-0186 with revisions)

3a. EFFECT OF WINGLETS ON PERFORMANCE AND HANDLING QUALITIES OF GENERAL AVIATION AIRCRAFT,
C. P. van Dam, B. J. Holmes and C. Pitts, AIAA Aircraft Systems Meeting AIAA Paper 80-1870, Anaheim, CA, August 4-6, 1980.

3b. Journal of Aircraft, Vol. 18, No. 7, July 1981, pp. 587-591. (AIAA Paper 80-1870 with revisions.)

4. FLIGHT EVALUATION OF THE EFFECT OF WINGLETS ON PERFORMANCE AND HANDLING QUALITIES OF SINGLE-ENGINE GENERAL AVIATION AIRPLANE,
B. J. Holmes, C. P. van Dam, P. W. Brown, and P. L. Deal, NASA TM 81892, December 1980.

1981 5. EFFECTS OF WINGTIP MODIFICATIONS ON HANDLING QUALITIES OF AGRICULTURAL AIRCRAFT,
C. P. van Dam, SAE Business Aircraft Meeting and Exposition, SAE Paper 810606, Wichita, KS, April 7-10, 1981.

1982 6. THE DESIGN INTEGRATION OF WINGTIP DEVICES FOR LIGHT GENERAL AVIATION AIRCRAFT,
R. V. Gifford, and C. P. van Dam, ICAS/AIAA Aircraft Systems and Technology Conference, ICAS Paper 82-1.4.4, Seattle, WA, August 22-27, 1982.

7a. NASA AERIAL APPLICATIONS WAKE INTERACTION RESEARCH,
D. J. Morris, C. C. Croom, B. J. Holmes, and C. P. van Dam, Joint Technical Session of American Society of Agricultural Engineers and National Agricultural Aviation Association, Paper No. AA-82-005, Las Vegas, Nevada, December 6, 1982.

7b. The World of Agricultural Aviation - Official Publication of the National Agricultural Aviation Association, April (Part I) and May (Part II), 1983.

1983 8. NASA WAKE INTERACTION RESEARCH AND APPLICATIONS,
D. J. Morris, C. C. Croom, B. J. Holmes, and C. P. van Dam, SAE Business Aircraft Meeting and Exposition, SAE Paper 830764, Wichita, KS, April 12-15, 1983.

1984 9. AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF DEPOSITION PATTERNS FROM AN AGRICULTURAL AIRPLANE,
D. J. Morris, C. C. Croom, C. P. van Dam, and B. J. Holmes, NASA TP 2348, September, 1984.

1985 10. NATURAL LAMINAR FLOW AND AIRPLANE STABILITY AND CONTROL,
C. P. van Dam, Laminar Flow Aircraft Certification, NASA CP 2413, Proceedings of a workshop held in Wichita, KS, April 14-15, 1985.

11. FLIGHT RESEARCH ON NATURAL LAMINAR FLOW,
B. J. Holmes, C. C. Croom, E. C. Hastings, Jr., C. J. Obara, C. P. van Dam, Langley Symposium on Aerodynamics, NASA CP 2397, Proceedings of a symposium held at NASA Langley Research Center, Hampton, VA, April 23-25, 1985.

12a. SWEPT WING-TIP SHAPES FOR LOW-SPEED AIRPLANES,
C. P. van Dam, SAE Aerospace Technology Conference and Exposition, SAE Paper 851770, Long Beach, CA, October 14-17, 1985

13b. SAE Transactions, Vol. 94, 1986, pp. 355.

1986 13a. SHAPING OF AIRPLANE FUSELAGES FOR MINIMUM DRAG,
S. S. Dodbele, C. P. van Dam, P.M.H.W. Vijgen, and B. J. Holmes, AIAA Aerospace Sciences Meeting, Paper No. 86-0316, Reno, Nevada, Jan. 6-9, 1986

13b. Journal of Aircraft, Vol. 24, No. 5, May 1987, pp. 298-304.

14a. EFFECTS OF COMPRESSIBILITY ON DESIGN OF SUBSONIC NATURAL LAMINAR FLOW FUSELAGES,
P.M.H.W. Vijgen, S. S. Dodbele, B. J. Holmes, C. P. van Dam, AIAA Applied Aerodynamics Conference, Paper No. 86-1825, San Diego, CA, June 9-11, 1986

14b. Journal of Aircraft, Vol. 25, No. 9, Sep. 1988, pp. 776-782.

15. DRAG-REDUCTION CHARACTERISTICS OF AFT-SWEPT WING TIPS,
C. P. van Dam, AIAA Applied Aerodynamics Conference, Paper No. 86-1824-CP, San Diego, CA, June 9-11, 1986.

16a. BOUNDARY-LAYER TRANSITION EFFECTS ON AIRPLANE STABILITY AND CONTROL,
C. P. van Dam, and B. J. Holmes, AIAA Flight Mechanics Conference, Paper No. 86-2229, Williamsburg, VA, August 18-20, 1986.

16b. Journal of Aircraft, Vol. 25, No. 8, Aug. 1988, pp. 702-709.

1987 17. EFFICIENCY CHARACTERISTICS OF CRESCENT-SHAPED WINGS AND CAUDAL FINS,
C. P. van Dam, Nature, Vol. 325, No. 6103, 1987, pp. 435-437.

18. INDUCED-DRAG CHARACTERISTICS OF CRESCENT-MOON-SHAPED WINGS,
C. P. van Dam, Journal of Aircraft, Vol. 24, No. 2, Feb. 1987, pp. 115-119.

19a. KEEL DESIGN FOR LOW VISCOUS DRAG,
C. J. Obara, C. P. van Dam, Proceedings of the 8th Chesapeake Sailing Yacht Symposium, Annapolis, MD, Mar. 6-7, 1987.

20b. Journal of Ship Research, Vol. 33, No. 2, Jun. 1989, pp. 145-155.

20a. SHEARED WING-TIP AERODYNAMICS: WIND-TUNNEL AND COMPUTATIONAL INVESTIGATIONS OF INDUCED-DRAG REDUCTION,
P.M.H.W. Vijgen, C. P. van Dam, B. J. Holmes, AIAA Applied Aerodynamics Conference, Paper No. 87-2481, Monterey, CA, August 17-19, 1987.

20b. SHEARED WING-TIP AERODYNAMICS: WIND-TUNNEL AND COMPUTATIONAL INVESTIGATION,
P.M.H.W. Vijgen, C. P. van Dam, B. J. Holmes, Journal of Aircraft, Vol. 26, No. 3, Mar. 1989, pp. 207-213.

21. COMPARISON OF SOLUTION TECHNIQUES FOR PARTIALLY-PARABOLIZED NAVIER-STOKES EQUATIONS,
C. P. van Dam, M. Hafez, J. Ahmad, Computational Fluid Dynamics, G. de Vahl Davis and C. Fletcher (Eds.), North-Holland, 1987, pp. 737-748.

1988 22a. CALCULATION OF VISCOUS FLOWS WITH SEPARATION USING NEWTON'S METHOD AND DIRECT SOLVER,
C. P. van Dam, M. Hafez, J. Ahmad, AIAA 26th Aerospace Sciences Meeting, Paper No. 88-0412, Reno, NV, Jan. 11-14, 1988.

22b. CALCULATIONS OF VISCOUS FLOW WITH SEPARATION USING NEWTON'S METHOD AND DIRECT SOLVER,
C. P. van Dam, M. Hafez, J. Ahmad, AIAA Journal, Vol. 28, No. 5, May 1990, pp. 937-939.

23. IN WIND AND WATER,
C. P. van Dam, The Sciences, Jan-Feb. 1988, pp. 36-39.

1989 24. UNSTEADY NAVIER-STOKES CALCULATIONS USING BIHARMONIC FORMULATION AND DIRECT SOLVER,
C. P. van Dam, M. Hafez, D. Brucker, AIAA 27th Aerospace Sciences Meeting, Paper No. 89-0465, Reno, NV, Jan. 9-12, 1989.

25. WIND-TUNNEL INVESTIGATIONS OF WINGS WITH SERRATED SHARP TRAILING EDGES,
P.M.H.W. Vijgen, C. P. van Dam, B. J. Holmes, F. G. Howard, Low Reynolds Number Aerodynamics, Lecture Notes in Engineering, No. 54, T. J. Mueller (Ed.), Springer-Verlag, 1989, pp. 295-313.

26a. HIGH-ALPHA CHARACTERISTICS OF CRESCENT AND ELLIPTIC WINGS,
C. P. van Dam, P.M.H.W. Vijgen, B. J. Holmes, AIAA Applied Aerodynamics Conference, Paper No. 89-2240-CP, Seattle, WA, July 31-August 2, 1989.

26b. AERODYNAMIC CHARACTERISTICS OF CRESCENT AND ELLIPTIC WINGS AT HIGH ANGLES OF ATTACK,
C. P. van Dam P.M.H.W. Vijgen, B. J. Holmes, Journal of Aircraft, Vol. 28, No. 4, Apr. 1991, pp. 253-260.

27. UNSTEADY VISCOUS FLOW CALCULATIONS INCLUDING SURFACE HEATING AND COOLING EFFECTS,
C. P. van Dam, M. Hafez, D. Brucker, S. Elli, Notes on Numerical Fluid Mechanics, P. Wesseling (Ed.), Vol. 29, Vieweg, 1990, pp.79-88.

28. KEELS AND RUDDERS WITH HIGHLY SWEPT TIPS,
C. P. van Dam, P.M.H.W. Vijgen, C. J. Obara, SailTech-89, Vol. 35, Western Periodicals Company, Proceedings of the 18th Annual Conference on Sailing Technology held at Stanford University, CA, October 14-15, 1989.

29. COMPARISON OF ITERATIVE AND DIRECT SOLUTION METHODS FOR VISCOUS FLOW PROBLEMS,
C. P. van Dam, M. Hafez, AIAA Journal, Vol. 27, No. 10, Oct. 1989, pp. 1459-1461.

1990 30. WIND-TUNNEL INVESTIGATION ON THE EFFECT OF THE CRESCENT PLANFORM SHAPE ON DRAG,
C. P. van Dam, P.M.H.W. Vijgen, B. J. Holmes, AIAA 28th Aerospace Sciences Meeting, Paper No. 90-0300, Reno, NV, January 8-11, 1990.

31a. SUBSONIC AND TRANSONIC LOW-REYNOLDS-NUMBER AIRFOILS WITH REDUCED PITCHING MOMENTS,
J. Reuther, C. P. van Dam, R. Hicks, AIAA/AHS/ASEE Aircraft Design, Systems and Operations Conference, Paper No. 90-3212, Dayton, OH, September 17-19, 1990.

31b. Journal of Aircraft, Vol. 29, No. 3, May-Jun. 1992, pp. 297-298.

32. PARAMETRIC ANALYSIS OF SWEPT-WING GEOMETRIES WITH SHEARED WING TIPS,
C. M. Fremaux, P.M.H.W. Vijgen, C. P. van Dam, AIAA/AHS/ASEE Aircraft Design Systems and Operations Conference, Paper No. 90-3196, Dayton, OH, September 17-19, 1990.

33. CALCULATION AND MEASUREMENT OF INDUCED DRAG AT LOW SPEEDS,
C. P. van Dam, K. Nikfetrat, P.M.H.W. Vijgen, C. M. Fremaux, SAE Aerospace and Technology Conference and Exposition, Paper No. 901935, Long Beach, CA, October 1-4, 1990.

34. TURBULENCE AND HEATING EFFECTS ON THE DESIGN AND PERFORMANCE OF LOW-DRAG KEELS,
P.M.H.W. Vijgen, C. P. van Dam, C. J. Obara, 2nd International Symposium on Performance Enhancement for Marine Applications, Newport, RI, October 14-16, 1990.

35. COMMENT ON "OPTICAL BOUNDARY-LAYER TRANSITION DETECTION IN A TRANSONIC WINDTUNNEL,"
P.M.H.W. Vijgen, C. P. van Dam, C. J. Obara, AIAA Journal, Vol. 28, No. 12, Dec. 1990, pp. 2142-2143.

1991 36. DRAG CALCULATIONS OF WINGS USING EULER METHODS,
C. P. van Dam, K. Nikfetrat, I. C. Chang, P.M.H.W. Vijgen, AIAA 29th Aerospace Sciences Meeting, Paper No. 91-0338, Reno, NV, January 7-10, 1991.

37. THE INFLUENCE OF A LAMINAR SEPARATION BUBBLE ON BOUNDARY-LAYER STABILITY,
S. Elli, C. P. van Dam, AIAA 9th Applied Aerodynamics Conference, Paper No. 91-3294, Baltimore, MD, September 23-25, 1991.

38. WING DESIGN CODE USING EULER EQUATIONS AND OPTIMIZATION,
I. C. Chang, F. Torres, C. P. van Dam, AIAA/AHS/ASEE Aircraft Design Systems and Operations Meeting, Paper No. 91-3190, Baltimore, MD, September 23-25, 1991.

39. EXPERIMENTAL INVESTIGATION ON THE EFFECT OF CRESCENT PLANFORM ON LIFT AND DRAG,
C. P. van Dam, P.M.H.W. Vijgen, B. J. Holmes, Journal of Aircraft, Vol. 28, No. 11, Nov. 1991, pp. 713-720.

1992 40. PREDICTION OF DRAG AT SUBSONIC AND TRANSONIC SPEEDS USING EULER METHODS,
K. Nikfetrat, C. P. van Dam, P.M.H.W. Vijgen, I. C. Chang, AIAA 30th Aerospace Sciences Meeting, Paper No. 92-0169, Reno, NV, January 6-9, 1992.

41. THE INFLUENCE OF BULGES ON BOUNDARY-LAYER INSTABILITY,
S. Elli, C. P. van Dam, K. Nikfetrat, 5th Symposium on Numerical and Physical Aspects of Aerodynamic Flows, Long Beach, CA, January 13-16, 1992.

42. ACCURATE PREDICTION OF DRAG USING EULER METHODS,
C. P. van Dam and K. Nikfetrat, Journal of Aircraft, Vol. 29, No. 3, May-June 1992, pp. 516-519.

43. PRACTICAL DESIGN OPTIMIZATION OF WING/BODY CONFIGURATION USING THE EULER EQUATIONS,
J. Reuther, S. E. Cliff, R. M. Hicks and C. P. van Dam, AIAA 10th Applied Aerodynamics Conference, Paper No. 92-2633, Palo Alto, CA, June 22-24, 1992.

44. FINITE-DIFFERENCE ALGORITHMS FOR THE TIME-DOMAIN MAXWELL'S EQUATIONS: A NUMERICAL APPROACH TO RCS ANALYSIS,
H. Vinh, H. A. Dwyer and C. P. van Dam, AIAA 23rd Plasma Dynamics and Lasers Conference, Paper No. 92-2989, Nashville, TN, July 6-8, 1992.

45. FINITE-DIFFERENCE METHODS FOR COMPUTATIONAL ELECTROMAGNETICS (CEM),
H. Vinh, H. A. Dwyer and C. P. van Dam, IEEE Antennas and Propagation Society International Symposium, 1992 Digest, Vol. 3, Chicago, IL, July 20-24, pp. 1682-1685.

46. SUBSONIC HIGH-LIFT FLIGHT RESEARCH ON THE NASA TRANSPORT SYSTEMS RESEARCH VEHICLE,
L. P. Yip, P.M.H.W.Vijgen, J. D. Hardin and C. P. van Dam, AIAA 6th Biennial Flight Test Conference, Paper No. 92-4103, Hilton Head, SC, August 24-26, 1992.

47. SIMULATION OF NONLINEAR TOLLMIEN-SCHLICHTING WAVE GROWTH THROUGH A LAMINAR SEPARATION BUBBLE,
C. P. van Dam and S. Elli, Instability, Transition, and Turbulence, M. Y. Hussaini, A. Kumar and C. L. Streett (Eds.), Springer-Verlag, 1992, pp. 311-321.

48. TURBULENCE EFFECTS ON THE DESIGN AND PERFORMANCE OF LOW-DRAG KEELS,
P.M.H.W. Vijgen, C. P. van Dam and C. J. Obara, Journal of Ship Research, Vol. 36, No. 3, Sept. 1992, pp. 268-279.

1993 49. RADAR-CROSS-SECTION AND AERODYNAMIC-FORCE CALCULATIONS USING FINITE-DIFFERENCE METHODS,
H. Vinh, C. P. van Dam and H. A. Dwyer, Proceedings of the 9th Annual Review of Progress in Applied Computational Electromagnetics, Monterey, CA, March 22-26, 1993, pp. 360-367.

50. LIFT AND DRAG CALCULATIONS FOR WINGS AND TAILS: TECHNIQUES AND APPLICATIONS,
C. P. van Dam, K. Nikfetrat, P.M.H.W. Vijgen, Contemporary Mathematics, Vol. 141, 1993, pp. 463-477.

51. COMPARISON OF PREDICTIONS OF AIRFOIL CHARACTERISTICS FOR THE NREL S805 AND S809 AIRFOILS,
D. B. Bernadett and C. P. van Dam, Proceedings of the Windpower '93 Conference, San Francisco, CA, July 1993, pp. 290-298.

52. SHAPE OPTIMIZATION FOR AERODYNAMIC EFFICIENCY AND LOW OBSERVABILITY,
H. Vinh, C. P. van Dam, and H. A. Dwyer, AIAA 24th Fluid Dynamics Conference, Paper No. 93-3115, Orlando, FL, July 6-9, 1993.

53. LEADING-EDGE TRANSITION AND RELAMINARIZATION PHENOMENA ON A SUBSONIC HIGH-LIFT SYSTEM,
C. P. van Dam, P. M. H. W. Vijgen, L. P. Yip, and R. C. Potter, AIAA 24th Fluid Dynamics Conference, Paper No. 93-3140, Orlando, FL, July 6-9, 1993.

54. TWO-DIMENSIONAL COMPUTATIONAL ANALYSIS OF A TRANSPORT HIGH-LIFT SYSTEM AND COMPARISON WITH FLIGHT-TEST RESULTS,
J. D. Hardin, R. C. Potter, C. P. van Dam, and L. P. Yip, AIAA Applied Aerodynamics Conference, Paper No. 93-3533, Monterey, CA, August 9-11, 1993.

55a. ACCURATE DRAG PREDICTION - A PREREQUISITE FOR DRAG REDUCTION RESEARCH,
K.J. Wong, T.K. Ayers, and C.P. van Dam, SAE Aerotech '93, Paper No. 932571, Costa Mesa, CA, Sept. 27-30, 1993.

55b. SAE Transactions, Section 1, Vol. 102, 1993, pp. 1882-1891.

56. IN-FLIGHT PRESSURE DISTRIBUTIONS AND SKIN-FRICTION MEASUREMENTS ON A SUBSONIC TRANSPORT HIGH-LIFT WING SECTION,
L.P. Yip, J.D. Hardin, P.M.H.W. Vijgen, and C.P. van Dam, High-Lift System Aerodynamics, AGARD CP-515, Sept. 1993, pp. 21-1 thru 21-19.

57. APPLIED AERODYNAMICS,
C.P. van Dam, Aerospace America, Dec. 1993, pp. 12-13.

1994 58. OPTIMIZATION OF WING-BODY CONFIGURATIONS BY THE EULER EQUATIONS,
I-C. Chang, F. Torres, F.P. Driscoll, and C.P. van Dam, AIAA 12th Applied Aerodynamics Conference, Paper No. 94-1899, Colorado Springs, CO, June 20-22, 1994.

59. AIRFOIL SHAPING FOR REDUCED RADAR CROSS SECTION,
H. Vinh, C.P. van Dam, and H.A. Dwyer, Journal of Aircraft, Vol. 31, No. 4, July - Aug. 1994, pp. 787-793.

60. OVERVIEW OF THE NASA B737-100 HIGH-LIFT FLIGHT RESEARCH PROGRAM,
L.P. Yip, C.P. van Dam, J.H. Whitehead, A. Bertelrud, S.J. Miley, P.M.H.W. Vijgen, M.G. Sextone, R.C. Potter, J.D. Hardin, D.C. Edge, and B.E. Gile Laflin, 19th Congress of the International Council of the Aeronautical Sciences (ICAS), Paper No. 94-1.1.2, Anaheim, CA, Sept. 18-23, 1994.

1995 61. NUMERICAL STUDY ON THE EFFECT OF TIP-CAP SHAPE ON WING AERODYNAMIC CHARACTERISTICS,
K.J. Wong and C.P. van Dam, AIAA 33rd Aerospace Sciences Meeting, Paper No. 95-0042, Reno, NV, Jan. 9-12, 1995.

62. VISCOUS-FLOW ANALYSIS OF A SUBSONIC TRANSPORT HIGH-LIFT SYSTEM INCLUDING COMPARISONS WITH FLIGHT-MEASURED RESULTS,
R.C. Potter, C.P. van Dam, and J.D. Hardin, AIAA 33rd Aerospace Sciences Meeting, Paper No. 95-0043, Reno, NV, Jan. 9-12, 1995.

63a. THE NASA B737-100 HIGH-LIFT PROGRAM - MEASUREMENTS AND COMPUTATIONS,
L.P. Yip, C.P. van Dam, J.H. Whitehead, J.D. Hardin, S.J. Miley, R.C. Potter, A. Bertelrud, D.D. Edge, and P.E. Willard, invited paper, Proceedings of the CEAS European Forum on High Lift and Separation Control, University of Bath, United Kingdom, March 29-31, 1995.

63b. The Aeronautical Journal, Vol. 99, No. 989, Nov. 1995, pp. 372-386.

64. DRAG PREDICTION ALGORITHMS FOR NAVIER-STOKES SOLUTIONS ABOUT AIRFOILS,
H. Vinh, C.P. van Dam, D. Yen, and R.S. Pepper, AIAA 13th Applied Aerodynamics Conference, Paper No. 95-1788, San Diego, CA, June 19-22, 1995.

65. A PARAMETRIC STUDY OF THE EFFECTS OF WING SHAPING ON RADAR SIGNATURE USING A FINITE-DIFFERENCE MAXWELL SOLVER,
H. Vinh, C.P. van Dam, and H.A. Dwyer, AIAA Plasmadynamics and Lasers Conference, Paper No. 95-1950, San Diego, CA, June 19-22, 1995.

66. IN-FLIGHT PRESSURE MEASUREMENTS ON A SUBSONIC TRANSPORT HIGH-LIFT WING SECTION,
L.P. Yip, P.M.H.W. Vijgen, J.D. Hardin, and C.P. van Dam, Journal of Aircraft, Vol. 32, No. 3, May - June 1995, pp. 529-538.

67. DRAG PREDICTION AT SUBSONIC AND TRANSONIC SPEEDS USING EULER METHODS,
C.P. van Dam, K. Nikfetrat, K. Wong, and P.M.H.W. Vijgen, Journal of Aircraft, Vol. 32, No. 4, July - August 1995, pp. 839-845.

68. SLAT TRANSITION CHARACTERISTICS ON THE NASA B737-100 AIRCRAFT USING INFRARED IMAGING AND HOT-FILM ANEMOMETRY,
S.J. Miley, C.P. van Dam, L.P. Yip, P.E. Willard, J.P. Crowder, and R.L. Watzlavick, Flow Visualization VII, J. Crowder (Ed.), Begell House, Sept. 1995, pp. 950-956.

69. ANALYSIS OF IN-FLIGHT BOUNDARY-LAYER STATE MEASUREMENTS ON A SUBSONIC TRANSPORT WING IN HIGH-LIFT CONFIGURATION,
C.P. van Dam, S.M. Los, S.J. Miley, L.P. Yip, D.W. Banks, V.E. Roback, and A. Bertelrud, 1st AIAA Aircraft Engineering, Technology, and Operations Congress, Paper No. 95-3911, Los Angeles, CA, Sept. 19-21, 1995.

1996 70. MODELING OF THE INTERACTION BETWEEN A LIFTING WING AND A FOLLOWING AIRCRAFT AND COMPARISON WITH EXPERIMENTAL RESULTS,
A.B Walden, C.P. van Dam, and J.M. Brandon, 34th Aerospace Sciences Meeting & Exhibit, Paper 96-0771, Reno, NV, January 15-18, 1996.

71. DESIGN METHODOLOGY FOR HIGH-LIFT SYSTEMS ON SUBSONIC AIRCRAFT,
R.S. Pepper, C.P. van Dam, and P.A. Gelhausen, 6th AIAA/NASA/ISSMO Symposium on Multidisciplinary Analysis and Optimization, Paper 96-4056-CP, Bellevue, WA, Sept. 4-6, 1996.

72. ATTACHMENT-LINE TRANSITION AND BOUNDARY-LAYER RELAMINARIZATION ON A HIGH-LIFT WING IN FLIGHT,
V.E. Roback, C.P. van Dam, S.M. Los, D.W. Banks, and L.P. Yip, 1996 SAE/AIAA World Aviation Congress, Paper 965564, Los Angeles, CA, Oct. 21-24, 1996.

1997 73. FINITE DIFFERENCE MAXWELL SOLVER TO STUDY GEOMETRIC SHAPE EFFECTS ON RADAR SIGNATURE,
H. Vinh, C.P. van Dam, and H.A. Dwyer, Journal of Aircraft, Vol. 34, No. 1, January-February 1997, pp. 56-63.

74. IN-FLIGHT BOUNDARY-LAYER MEASUREMENTS ON A HIGH-LIFT SYSTEM: SLAT,
C.P. van Dam, S.M. Los, S.J. Miley, V.E. Roback, L.P. Yip, A. Bertelrud, and P.M.H.W. Vijgen, Journal of Aircraft, Vol. 34, No. 6, November-December 1997, pp. 748-756.

75. IN-FLIGHT BOUNDARY-LAYER MEASUREMENTS ON A HIGH-LIFT SYSTEM: MAIN ELEMENT AND FLAP,
C.P. van Dam, S.M. Los, S.J. Miley, V.E. Roback, L.P. Yip, A. Bertelrud, and P.M.H.W. Vijgen, Journal of Aircraft, Vol. 34, No. 6, November-December 1997, pp. 757-763.

76. DRAG PREDICTION FOR AIRFOILS IN VISCOUS TRANSONIC FLOW,
C.P. van Dam and D.D. Chao, Proceedings of Advances in Flow Simulation Techniques - A Conference Dedicated to the Memory of Joseph L. Steger, University of California, Davis, May 1997, pp. 288-300.

1998 77. STATISTICAL ANALYSIS OF IN-FLIGHT HOT-FILM SIGNALS OF TRANSITIONAL FLOWS,
S.M. Los and C.P. van Dam, 29th AIAA Fluid Dynamics Conference, Paper 98-2440, Albuquerque, NM, June 1998.

78. AIRFOIL DRAG PREDICTION AND DECOMPOSITION,
D.D. Chao and C.P. van Dam, 16th AIAA Applied Aerodynamics Conference, Paper 98-2783, Albuquerque, NM, June 1998.

79. REMOTE IN-FLIGHT BOUNDARY LAYER TRANSITION VISUALIZATION USING INFRARED THERMOGRAPHY,
C.P. van Dam, H.J. Shiu, and D.W. Banks, Paper 181, CD Rom Proceedings of 8th International Symposium on Flow Visualization, G.M. Carlomagno & I. Grant (Editors), Sorrento, Italy, September 1998.

80. REMOTE IN-FLIGHT INFRARED IMAGING FOR ANALYZING SURFACE FLOWS,
D.W. Banks, C.P. van Dam, and H.J. Shiu, NASA Tech Briefs, September 1998, p. 76.

1999 81. NAVIER-STOKES SIMULATIONS OF THE NREL COMBINED EXPERIMENT PHASE II ROTOR,
E. Duque, C.P. van Dam, and S. Hughes, 1999 ASME Wind Energy Symposium / 37th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 99-0037, Reno, NV, January 1999.

82. GURNEY FLAP EXPERIMENTS ON AIRFOIL AND WINGS,
C.P. van Dam, D.T. Yen, and P.M.H.W. Vijgen, Journal of Aircraft, Vol. 36, No.2, March-April 1999, pp. 484-486.

83. NAVIER-STOKES ANALYSIS OF TIME-DEPENDENT FLOWS ABOUT WIND TURBINES,
E. Duque, C.P. van Dam, R.R. Brodeur, and D.D. Chao, 3rd ASME/JSME Joint Fluids Engineering Conference, San Francisco, CA, July 1999.

84. AIRFOIL DRAG PREDICTION AND DECOMPOSITION,
D.D. Chao and C.P. van Dam, Journal of Aircraft, Vol. 36, No. 4, July-Aug. 1999, pp. 675-681.

85. AERO-MECHANICAL DESIGN METHODOLOGY FOR SUBSONIC CIVIL TRANSPORT HIGH-LIFT SYSTEMS,
C.P. van Dam, S.G. Shaw, J.C. Vander Kam, R.R. Brodeur, P.K.C. Rudolph, D. Kinney, *Aerodynamic Design and Optimisation of Flight Vehicles in a Concurrent Multi-Disciplinary Environment*, RTO MP 35, June 2000, pp. 7-1 through 7-12. (NATO Conference held in Ottawa, Canada, Oct. 18-21, 1999).

86. AERO-MECHANICAL DESIGN OF HIGH-LIFT SYSTEMS,
C.P. van Dam, S.G. Shaw, J.C. Vander Kam, P.K.C. Rudolph, D. Kinney, Aircraft Engineering and Aerospace Technology, Vol. 71, No. 5, 1999, pp. 436-443.

87. RECENT EXPERIENCE WITH DIFFERENT METHODS OF DRAG PREDICTION,
C.P. van Dam, Progress in Aerospace Sciences, Vol. 35, No. 8, Nov. 1999, pp. 751-798.

2000 88 TRANSITION PREDICTION FOR A TWO DIMENSIONAL NAVIER-STOKES SOLVER APPLIED TO WIND-TURBINE AIRFOILS,
R.R. Brodeur, and C.P. van Dam, 2000 ASME Wind Energy Symposium / 38th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2000-0047, Reno, NV, January 2000.

89. HIGH-LIFT DESIGN METHODOLOGY FOR SUBSONIC CIVIL TRANSPORT AIRCRAFT,
C.P. van Dam, J.K. Paris, and J.C. Vander Kam, invited paper for presentation at 2000 IEEE Aerospace Conference Gateway to 21st Century Technology, Big Sky, Montana, March 18-25, 2000.

90. NUMERICAL PREDICTIONS OF WIND TURBINE POWER AND AERODYNAMIC LOADS FOR THE NREL PHASE II COMBINED EXPERIMENT ROTOR, E.P.N. Duque, W. Johnson, C.P. van Dam, R. Cotes, and K. Yee, 2000 ASME Wind Energy Symposium / 38th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2000-0038, Reno, NV, January 2000.

91. ACTIVE LOAD CONTROL AND LIFT ENHANCEMENT USING MEM TRANSLATIONAL TABS,
D.T. Yen, C.P. van Dam, F. Bräeuchle, R.L. Smith, and S.D. Collins, AIAA Fluids 2000, AIAA Paper 2000-2422, Denver, CO, June 2000.

92. VISUALIZATION OF IN-FLIGHT FLOW PHENOMENA USING INFRARED THERMOGRAPHY,
D.W. Banks, C.P. van Dam, H.J. Shiu, and G.M. Miller, Proceedings of 9th International Symposium on Flow Visualization, Edinburgh, Scotland, August 2000.

93. COMPUTATIONAL STUDY OF ROTARY TESTS ON FOREBODY MODELS, C.P. van Dam,. T. Dal Bello, E. Duque, C.M. Fremaux, AIAA Atmospheric Flight Mechanics Conference, AIAA paper 2000-4105, Denver, CO, August 14-17, 2000.

2001 94. ACTIVE LOAD CONTROL FOR WIND TURBINE BLADES USING MEM TRANSLATIONAL TABS,
D.T. Yen, C.P. van Dam, R.L. Smith, and S.D. Collins, 2001 ASME Wind Energy Symposium / 39th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2001-0031, Reno, NV, January 2001.

95. PREDICTION OF FLOWS ABOUT FOREBODIES AT HIGH-ANGLE-OF-ATTACK DYNAMIC CONDITIONS,
C.P. van Dam, S. Saephan, C.M. Fremaux, and T. DalBello, *Vortex Flow and High Angle of Attack*, RTO MP 69, May 2001 (NATO Conference held in Loen, Norway, May 7-11, 2001 (ISBN 92-837-0022-8).

96 WIND TURBINES,
C.P. van Dam, *McGraw-Hill Yearbook of Science & Technology 2002*, McGraw-Hill, New York, 2001, pp. 413-416.

97. ACTIVE LOAD CONTROL FOR AIRFOILS USING MICROTABS,
D.T. Yen Nakafuji, C.P. van Dam, R.L.Smith, and S.D. Collins, Journal of Solar Energy Engineering, Vol. 123, November 2001, pp. 282-289.

98. DESIGN-ORIENTED HIGH-LIFT METHODOLOGY FOR GENERAL AVIATION AND CIVIL TRANSPORT AIRCRAFT,

C.P. van Dam, J.C. Vander Kam, and J.K. Paris, Journal of Aircraft, Vol. 38, No. 6, Nov-Dec. 2001, pp. 1076-1084.

99. TRANSITION PREDICTION FOR A TWO-DIMENSIONAL NAVIER-STOKES SOLVER APPLIED TO WIND-TURBINE AIRFOILS,
R.R. Brodeur, and C.P. van Dam, Wind Energy, Vol. 4, No. 2, 2001, pp. 61-75.

2002 100. BUBBLE INDUCED UNSTEADINESS ON WIND TURBINE AIRFOILS,
E.A. Mayda, C.P. van Dam, and E.P.N. Duque, 2002 ASME Wind Energy Symposium / 40th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2002-0033, Reno, NV, January 2002.

101. LOAD CONTROL FOR TURBINE BLADES: A NON-TRADITIONAL MICROTAB APPROACH,
D.T. Yen Nakafuji, C.P. van Dam, J. Michel, and P. Morrison, 2002 ASME Wind Energy Symposium / 40th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2002-0054, Reno, NV, January 2002.

102. ON THE AERODYNAMIC DESIGN OF MULTI-ELEMENT HIGH-LIFT SYSTEMS, C.P. van Dam, Progress in Aerospace Sciences, Vol. 38, No.2, 2002, pp. 101-144.

103. BUBBLE INDUCED UNSTEADINESS ON A WIND TURBINE AIRFOIL,
E.A. Mayda, and C.P. van Dam, Journal of Solar Energy Engineering, Vol. 124, Nov. 2002, pp. 335-344.

104. IN-FLIGHT VISUALIZATION OF SUPERSONIC FLOW TRANSITION USING INFRARED IMAGING,
C.P. van Dam, H.J. Shiu, D.W. Banks, R.R.Tracy, and J. Chase, Journal of Aircraft, Vol. 39, No. 6, November–December 2002, pp. 936-944.

2003 105. ANALYSIS OF BLUNT TRAILING EDGE AIRFOILS,
K.J. Standish and C.P. van Dam, 2003 ASME Wind Energy Symposium / 41th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2003-0353, Reno, NV, January 2003.

106a. BLADE-WAKE INTERACTION NOISE FOR TURBINES WITH DOWNWIND ROTORS,
G.M. McNerney, C.P. van Dam, D.T. Yen-Nakafuji, 2003 ASME Wind Energy Symposium / 41th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2003-1184, Reno, NV, January 2003.

106b. Journal of Solar Energy Engineering, Vol. 125, Nov. 2003, pp. 497-505.

107. COMPUTATIONAL DESIGN AND ANLYSIS OF A MICRO-TAB BASED AERODYNAMIC LOADS CONTROL SYSTEM FOR LIFTING SURFACES,
C.P. van Dam, D. Yen Nakafuji, C. Bauer, D. Chao, K. Standish, *Proceedings of SPIE* Vol. 4981, Paper 4981-06, SPIE Micromachining and Microfabrication, San Jose, CA, January 2003, pp. 28-39.

108. AIRCRAFT DESIGN AND THE IMPORTANCE OF DRAG PREDICTION,
C.P. van Dam, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, VKI LS 2004-01, Rhode Saint Genèse, Belgium, February 3-7, 2003.

109. CRITICAL FACTORS IN CFD-BASED DRAG PREDICTION,
C.P. van Dam, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, VKI LS 2004-01, Rhode Saint Genèse, Belgium, February 3-7, 2003.

110. BOUNDARY LAYER TRANSITION AND ITS PREDICTION,
C.P. van Dam, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, VKI LS 2004-01, Rhode Saint Genèse, Belgium, February 3-7, 2003.

111. FORCES AND MOMENTS ON GENERIC AIRCRAFT FOREBODIES AT HIGH ANGLES OF ATTACK ROTARY CONDITIONS,
S. Saephan, C.P. van Dam, and C.M. Fremaux, AIAA Atmospheric Flight Mechanics Conference, AIAA Paper 2003-5472, Austin, TX, Aug. 2003

112. AERODYNAMIC ANALYSIS OF BLUNT TRAILING EDGE AIRFOILS,
K.J. Standish and C.P. van Dam, Journal of Solar Energy Engineering, Vol. 125, Nov. 2003, pp. 479-487.

2004 113a. COMPUTATIONAL ANALYSIS OF A MICRO-TAB BASED AERODYNAMIC LOAD CONTROL SYSTEM FOR ROTOR BLADES,
K.J. Standish and C.P. van Dam, paper presented at AHS 4th Decennial Specialists' Conference on Aeromechanics, San Francisco, CA, Jan. 2004.

113b. Journal of the American Helicopter Society, Vol. 50, No. 3, July 2005, pp. 249-258.

114. AUTOMATIC GENERATION OF AIRFOIL PERFORMANCE TABLES USING A TWO-DIMENSIONAL NAVIER-STOKES SOLVER,
E.A. Mayda and C.P. van Dam, paper presented at AHS 4th Decennial Specialists' Conference on Aeromechanics, San Francisco, CA, Jan. 2004.

115. SIMULATION OF FLOW ABOUT ROTATING FOREBODIES AT HIGH ANGLES OF ATTACK,
S. Saephan, C.P. van Dam, C.M. Fremaux, and T. DalBello, Journal of Aircraft, Vol. 41, No. 6, Nov-Dec. 2004, pp. 1298-1305.

2005 116. INNOVATIVE STRUCTURAL AND AERODYNAMIC DESIGN APPROACHES FOR LARGE WIND TURBINE BLADES,
C.P. van Dam, E.A. Mayda, D.D. Chao, K. Jackson, M.D. Zuteck, D. Berry, 2005 ASME Wind Energy Symposium / 43th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2005-0973, Reno, NV, Jan. 2005.

117. COMPUTATIONAL INVESTIGATION OF FINITE WIDTH MICROTABS FOR AERODYNAMIC LOAD CONTROL,
E.A. Mayda, C. P. van Dam, D. Yen-Nakafuji, 2005 ASME Wind Energy Symposium / 43th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2005-1185, Reno, NV, Jan. 2005.

118. TWO-DIMENSIONAL WIND TUNNEL AND COMPUTATIONAL INVESTIGATION OF A MICROTAB MODIFIED S809 AIRFOIL,
J.P. Baker, K.J. Standish, C.P. van Dam, 2005 ASME Wind Energy Symposium / 43th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2005-1186, Reno, NV, Jan. 2005.

119. INNOVATIVE DESIGN APPROACHES FOR LARGE WIND TURBINE BLADES, K. Jackson, M. Zuteck, C.P. van Dam, K.J. Standish, and D. Berry, Wind Energy, Vol. 8, No. 2, 2005, pp. 141-171.

120. AUTOMATIC GENERATION OF AIRFOIL PERFORMANCE TABLES USING A TWO-DIMENSIONAL NAVIER-STOKES SOLVER,
E.A. Mayda and C.P. van Dam, Journal of the American Helicopter Society, Vol. 50, No. 4, Oct. 2005, pp. 338-348.

121. WIND TURBINE GENERATOR TRENDS FOR SITE SPECIFIC TAILORING,
K. Jackson, C.P. van Dam, and D. Yen-Nakafuji , Wind Energy. Vol. 8, No. 4, Oct-Dec. 2005, pp. 443-455.

2006 122. COMPUTATIONAL AND EXPERIMENTAL ANALYSIS OF A FLATBACK WIND TURBINE AIRFOIL,
J.P. Baker, E.A. Mayda, and C.P. van Dam, 2006 ASME Wind Energy Symposium / 44th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2006-0193, Reno, NV, Jan. 2006.

123. RANS ANALYSIS OF AN INBOARD FLATBACK MODIFICATION TO THE NREL PHASE VI ROTOR,
D.D. Chao and C.P. van Dam, 2006 ASME Wind Energy Symposium / 44th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2006-0195, Reno, NV, Jan. 2006.

124. DESIGN AND NUMERICAL OPTIMIZATION OF THICK AIRFOILS,
T. Winnemöller and C.P. van Dam, 44th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2006-0238, Reno, NV, Jan. 2006.

125. UNSTEADY COMPUTATIONAL INVESTIGATIONS OF DEPLOYING LOAD CONTROL TABS,
R. Chow and C.P. van Dam, 44th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2006-1063, Reno, NV, Jan. 2006.

126. WING DRAG PREDICTION AND DECOMPOSITION,
D.D. Chao, and C.P. van Dam, Journal of Aircraft, Vol. 43, No. 1, Jan-Feb. 2006, pp. 82-90.

127. SIMULATION OF THE TUMBLING BEHAVIOR OF TAILLESS AIRCRAFT,
S. Saephan and C.P. van Dam, AIAA Applied Aerodynamics Conference, AIAA Paper 2006-3321, San Francisco, CA, Jun. 2006.

128. DETERMINATION OF DYNAMIC STABILITY INFORMATION THROUGH SIMULATION OF A TUMBLING TAILLESS AIRCRAFT,
S. Saephan and C.P. van Dam, AIAA Atmospheric Flight Mechanics Conference, AIAA Paper 2006-6131, Keystone, CO, Aug. 2006.

129. UNSTEADY COMPUTATIONAL INVESTIGATIONS OF DEPLOYING LOAD CONTROL TABS,
R. Chow and C.P. van Dam, Journal of Aircraft, Vol. 43, No. 5, Sep-Oct. 2006, pp. 1458-1469.

130. EXPERIMENTAL ANALYSIS OF A THICK BLUNT TRAILING EDGE WIND TURBINE AIRFOIL,
J.P. Baker, E.A. Mayda, and C.P. van Dam, Journal of Solar Energy Engineering, Vol. 128, Nov. 2006, pp. 422-431.

2007 131. COMPUTATIONAL INVESTIGATIONS OF DEPLOYING LOAD CONTROL MICROTABS ON A WIND TURBINE AIRFOIL,

R, Chow and C.P. van Dam, 2007 ASME Wind Energy Symposium / 45th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2007-1018, Reno, NV, Jan. 2007.

132. DESIGN AND NUMERICAL OPTIMIZATION OF THICK AIRFOILS,
T. Winnemöller and C.P. van Dam, Journal of Aircraft, Vol. 44, No. 1, Jan-Feb. 2007, pp. 232-240.

133. TWO-DIMENSIONAL WIND TUNNEL AND COMPUTATIONAL INVESTIGATION OF A MICROTAB MODIFIED AIRFOIL,
J.P. Baker, K.J Standish, and C.P. van Dam, Journal of Aircraft, Vol. 44, No. 2, Mar-Apr. 2007, pp. 563-572.

134. BOUNDARY LAYER TRANSITION PREDICTION FOR RANS FLOW SOLVERS,
E.A. Mayda, and C.P. van Dam, Proceedings of the 2nd European Conference for Aerospace Sciences, Brussels, Belgium, July 1-8, 2007.

135. ACTIVE AERODYNAMIC LOAD CONTROL OF WIND TURBINE BLADES,
D.E. Berg, J.R. Zayas, D.W. Lobitz, C.P. van Dam, R. Chow, J.P. Baker, Proceedings of the 5th Joint ASME/JSME Fluids Engineering Conference, FEDSM2007-37604, San Diego, CA, July 30 – August 2, 2007.

136. COMPUTATIONAL INVESTIGATIONS OF SMALL DEPLOYING TABS AND FLAPS FOR AERODYNAMIC LOAD CONTROL,
C.P. van Dam, R. Chow, J.R. Zayas, D.E. Berg, *The Science of Making Torque from Wind*, TU Denmark, August 2007 (Journal of Physics: Conference Series, Vol. 75, 2007, Paper 012127, http://www.iop.org/EJ/toc/1742-6596/75/1)

137. COMPUTATIONAL AERODYNAMIC ANALYSIS OF AN INBOARD BLUNT TRAILING EDGE MODIFICATION TO THE NREL PHASE VI ROTOR,
D.D. Chao and C.P. van Dam, Wind Energy, Vol. 10, No. 6, 2007, pp. 529-550.

2008 138. INTEGRATED METHOD OF CFD AND GRID GENERATION FOR AUTOMATIC GENERATION OF AIRFOIL PERFORMANCE TABLES,
S.Y. Yoo, R. Chow, E.A. Mayda, C.P. van Dam, 2008 ASME Wind Energy Symposium / 46th AIAA Aerospace Sciences Meeting & Exhibit, AIAA Paper 2008-1332, Reno, NV, Jan. 2008.

139. DETERMINATION OF WING-ONLY AIRCRAFT TUMBLING CHARACTERISTICS THROUGH COMPUTATIONAL FLUID DYNAMICS,
S. Saephan., C.P. van Dam, Journal of Aircraft, Vol. 45, No. 3, May-Jun. 2008, pp. 1044-1053.

140. DRAG REDUCTION OF BLUNT TRAILING EDGE AIRFOILS,
J.P. Baker, C.P. van Dam, BBAA VI International Colloquium on Bluff Bodies Aerodynamics & Applications, Milan, Italy, July 20-24, 2008.

2010 141. AN OVERVIEW OF ACTIVE LOAD CONTROL TECHNIQUES FOR WIND TURBINES WITH AN EMPHASIS ON MICROTABS,
S.J. Johnson, J.P. Baker, C.P. van Dam, D.E. Berg, Wind Energy, Vol. 13, No. 2-3, 2010, pp. 239-253.

142. ON THE TEMPORAL RESPONSE OF ACTIVE LOAD CONTROL DEVICES,
R. Chow, C.P. van Dam, Wind Energy, Vol. 13, No. 2-3, 2010, pp. 135-149.

143. THICK AIRFOILS WITH BLUNT TRAILING EDGE FOR WIND TURBINE BLADES,
C.P. van Dam, A. Cooperman, A. McLennan, R. Chow, J.P. Baker, Proceedings of ASME Turbo Expo 2010, GT2010-23786, Glasgow, UK, June 2010.

144. COMPARISON OF MICROJETS WITH MICROTABS FOR ACTIVE AERODYNAMIC LOAD CONTROL,
M. Blaylock, R. Chow, C.P. van Dam, AIAA Flow Control Conference, AIAA-2010-4409, Chicago, 28 June -1 July 2010.

145. AERODYNAMIC PERFORMANCE OF THICK BLUNT TRAILING EDGE AIRFOILS,
A. Cooperman, A. McLennan, J.P. Baker, C.P. van Dam, AIAA Applied Aerodynamics Conference, AIAA-2010-4228, Chicago, 28 June -1 July 2010.

146. INBOARD FLOW SEPARATION ON THE NREL 5-MW ROTOR,
R. Chow, C.P. van Dam, Proceedings Torque 2010: The Science of Making Torque from Wind, Crete, Greece, 28-30 June 2010, pp. 299-309.

147. PITCH CONTROL ALGORITHM TO BALANCEBLADE DAMAGING BLADE LOAD PERTURBATIONS AND TURBINE PERFORMANCE,
S. Johnson, S. Larwood, G. McNerney, C.P. van Dam, Proceedings Torque 2010: The Science of Making Torque from Wind, Crete, Greece, 28-30 June 2010, pp. 655-665.

Papers and Books Accepted for Publication

1. INBOARD STALL AND SEPARATION MITIGATION TECHNIQUES ON WIND TURBINE ROTORS,
R. Chow, C.P. van Dam, accepted for presentation at 2011 ASME Wind Energy Symposium / 48th AIAA Aerospace Sciences Meeting & Exhibit, Orlando, FL, Jan. 2011.

2. EXPERIMENTAL AND COMPUTATIONAL ANALYSIS OF A WIND TURBINE AIRFOIL WITH ACTIVE MICROTABS,
A. Cooperman, R. Chow, S. Johnson, C.P. van Dam, accepted for presentation at 2011 ASME Wind Energy Symposium / 48th AIAA Aerospace Sciences Meeting & Exhibit, Orlando, FL, Jan. 2011.

Papers and Books Submitted for Publication

1. SWEPT WIND TURBINE BLADE DYNAMIC MODELING,
S. Larwood, C.P. van Dam, submitted for publication in Wind Energy, 2009.

2. PITCH CONTROL ALGORITHM TO BALANCE DAMAGING LOAD PERTURBATIONS AND TURBINE PERFORMANCE,
S. Johnson, S. Larwood, G. McNerney, C.P. van Dam, submitted for publication in Wind Energy, 2010.

Papers and Books in Preparation

1. TECHNIQUES TO REDUCE LIFT-INDUCED DRAG,
C.P. van Dam, P.M.W.H. Vijgen for publication in Progress in Aerospace Sciences.

Patents Issued

1988 1. AIRCRAFT STALL-SPIN ENTRY DETERRENT SYSTEM,
U.S. Patent No. 4,776,542, C.P. van Dam, Issued October 11, 1988.

2006 2. ACTIVE SYSTEM FOR CONTROL OF AERODYNAMIC LOADING USING MICROFABRICATED TRANSLATIONAL TABS,
U.S. Patent No. 7,028,954, C.P. van Dam, D.T. Yen, R.L. Smith, S.D. Collins, Issued April 18, 2006.

3. METHOD AND APPARATUS FOR AUTOMATICALLY GENERATING AIRFOIL PERFORMANCE TABLES,
U.S. Patent No. 7,124,038, C.P. van Dam, E.A. Mayda, R.C. Strawn, Issued October 17, 2006.

Abstracts and Reports

1977 1. CALCULATION OF THE OFF-DESIGN PERFORMANCE OF TURBOJET AND TURBOFAN ENGINES,
C.P. van Dam, Published in Dutch, Delft University of Technology, Delft, The Netherlands, June 1977.

2. A RESEARCH PROGRAM TO REDUCE INTERIOR NOISE IN GENERAL AVIATION AIRPLANES,
J. Roskam, V.U. Muirhead, H.W. Smith, T.D. Perschier, D. Durenberger, C.P. van Dam, and T.C. Shu, NASA CR 155154, October 1977.

1978 3. A RESEARCH PROGRAM TO REDUCE INTERIOR NOISE IN GENERAL AVIATION AIRPLANES: NOISE REDUCTION THROUGH A CAVITY-BACKED FLEXIBLE PLATE,
C.P. van Dam, J. Roskam, NASA CR 157588, August 1978.

1979 4. COMPARISON OF THEORETICAL PREDICTED LONGITUDINAL AERODYNAMICS CHARACTERISTICS WITH FULL-SCALE WIND-TUNNEL DATA ON THE ATLIT AIRPLANE,
C.P. van Dam, M. Griswold, and J. Roskam, NASA CR 158753, July 1979.

1982 5. THE DESIGN INTEGRATION OF WINGTIP DEVICES FOR LIGHT GENERAL AVIATION AIRCRAFT,
R.V. Gifford and C.P. van Dam, NASA TM 83252, August 1982. (ICAS Paper 82-1.4.4 with revisions.)

6. ANALYSIS OF NONPLANAR WING-TIP MOUNTED LIFTING SURFACES ON LOW-SPEED AIRPLANES,
C.P. van Dam, Doctor of Engineering Dissertation, University of Kansas, Lawrence, KS, December 1982.

1983 7. ANALYSIS OF NONPLANAR WING-TIP MOUNTED LIFTING SURFACES ON LOW-SPEED AIRPLANES,
C.P. van Dam, NASA CR 3684, June 1983.(Doctor of Engineering Dissertation with revisions.)

1984 8. NATURAL LAMINAR FLOW AIRFOIL DESIGN CONSIDERATIONS FOR WINGLETS ON LOW-SPEED AIRPLANES,
C.P. van Dam, NASA CR 3853, October 1984.

1986 9. DESIGN OF FUSELAGE SHAPES FOR NATURAL LAMINAR FLOW,
S.S. Dodbele, C.P. van Dam, P.M.H.W. Vijgen, NASA CR 3970, March 1986.

1989 10. HIGH ANGLE-OF-ATTACK AERODYNAMIC CHARACTERISTICS OF CRESCENT AND ELLIPTIC WINGS,
C.P. van Dam, NASA CR 184992, May 1989.

1991 11. WORKSHOP ON BIOFLUIDDYNAMICS,
A.Y. Cheer and C.P. van Dam, NASA CR 193494, Aug. 1991.

1994 12. NUMERICAL SIMULATION OF HELICOPTER ENGINE PLUME IN FORWARD FLIGHT,
C.B. Dimanlig, C.P. van Dam, E.P.N. Duque, NASA CR 197488, 1994.

1995 13. VISCOUS-FLOW ANALYSIS OF A SUBSONIC TRANSPORT AIRCRAFT HIGH-LIFT SYSTEM AND CORRELATION WITH FLIGHT DATA,
R.C. Potter, C.P. van Dam, NASA CR 199610, 1995.

14. ANALYSIS OF IN-FLIGHT BOUNDARY-LAYER STATE MEASUREMENTS ON A SUBSONIC TRANSPORT WING IN HIGH-LIFT CONFIGURATION,
C.P. van Dam, S.M. Los, S.J. Miley, L.P. Yip, D.W. Banks, V.E. Roback, and A. Bertelrud, NASA CR 200146, Sep. 1995

1996 15. A COMPARISON OF COMPUTED AND EXPERIMENTAL FLOWFIELDS OF THE RAH-66 HELICOPTER,
C.P. van Dam, A.M. Budge, and E.P.N. Duque, NASA CR 200906, Jan. 1996.

16. DESIGN METHODOLOGY FOR MULTI-ELEMENT HIGH-LIFT SYSTEMS ON SUBSONIC CIVIL TRANSPORT AIRCRAFT,
R.S. Pepper, C.P. van Dam, NASA CR 202365, August 1996.

1997 17. STUDY OF THE MUTUAL INTERACTION BETWEEN A WING WAKE AND AN ENCOUNTERING AIRPLANE,
A.B. Walden, C.P. van Dam, NASA CR 206493, March 1996.

18. IN-FLIGHT FLOW VISUALIZATION USING INFRARED THERMOGRAPHY,
C.P. van Dam, H.J. Shiu, and D.W. Banks, NASA CR 207087, November 1997.

19. ANALYSIS OF BOUNDARY-LAYER STATE MEASUREMENTS ON NASA LANGLEY'S TSRV (B737-100),
C.P. van Dam, S.M. Los, Final Report to Boeing Commercial Airplane Group, December 1997.

2000 20. VISUALIZATION OF IN-FLIGHT FLOW PHENOMENA USING INFRARED THERMOGRAPHY,
D.W. Banks, C.P. van Dam, H.J. Shiu, and G.M. Miller, NASA TM-2000-209027, July 2000.

2001 21. FLIGHT INVESTIGATION OF THE EFFECTS OF PRESSURE-BELT TUBING SIZE ON MEASURED PRESSURE DISTRIBUTIONS,
N.A. Rivers, C.P. van Dam, P.W. Brown, and R.A. Rivers, NASA TM-2001-209857, November 2001.

2002 22. PARAMETRIC STUDY FOR LARGE WIND TURBINE BLADES,
TPI Composites Inc., SAND2002-2519, August 2002.

2003 23. INNOVATIVE DESIGN APPROACHES FOR LARGE WIND TURBINE BLADES, TPI Composites Inc., SAND2003-0723, March 2003.

24. COST STUDY FOR LARGE WIND TURBINE BLADES: WINDPACT BLADE SYSTEM DESIGN STUDIES, TPI Composites Inc., SAND2003-1428, May 2003.

2004 25. INNOVATIVE DESIGN APPROACHES FOR LARGE WIND TURBINE BLADES - FINAL REPORT, TPI Composites Inc., SAND2004-0074, May 2004.

2008 26. TRAILING EDGE MODIFICATIONS FOR FLATBACK AIRFOILS, C.P. van Dam, D.L. Kahn, and D.E. Berg, SAND2008-1781, March 2008.

27. COMPUTATIONAL DESIGN AND ANALYSIS OF FLATBACK AIRFOIL WIND TUNNEL EXPERIMENT, C.P. van Dam, E.A. Mayda, D.D. Chao, and D.E. Berg, SAND2008-1782, March 2008.

28. CFD ANALYSIS OF ROTATING TWO-BLADED FLATBACK WIND TURBINE ROTOR, D.D. Chao, and C.P. van Dam, SAND2008-1688, April 2008.

29. FLATBACK AIRFOIL WIND TUNNEL EXPERIMENT, J.P. Baker, C.P. van Dam, and B.L. Gilbert, SAND2008-2008, April 2008.

30. ACTIVE LOAD CONTOL TECHNIQUES FOR WIND TURBINES, S. J. Johnson, C.P. van Dam, and D.E. Berg, SAND2008-4809, August 2008.

2010 31. SWEEP-TWIST ADAPTIVE ROTOR BLADE: FINAL PROJECT REPORT, Knight & Carver Wind Group, SAND2009-8037, February 2010

Lectures, Oral Presentations, Seminars

Since June 1997 (partial list):

1. ANALYSIS OF BOUNDARY-LAYER STATE MEASUREMENTS ON NASA LANGLEY'S TSRV (B737-100), Boeing Commercial Airplane Group, Renton, WA, July 17, 1997.

2. HIGH LIFT AERODYNAMICS FOR CONCEPTUAL AND PRELIMINARY AIRCRAFT DESIGN, NASA Ames Research Center, Moffett Field, CA, September 9, 1997.

3. NUMERICAL SIMULATION OF WIND TURBINE AERODYNAMICS, National Renewable Energy Laboratory, Golden, CO, November 21, 1997.

4. BOUNDARY-LAYER TRANSITION AND RELAMINARIZATION PHENOMENA ON AIRCRAFT WINGS, UC Davis MAE Department Seminar, February 19, 1998.

5. AIRPLANE PERFORMANCE ENHANCEMENT AND FLIGHT CONTROL USING MICROMACHINED TRANSLATIONAL DEVICES, Naval Research Laboratory, Washington, DC, March 27, 1998.

6. 3D MODELING OF THE UNSTEADY AERODYNAMICS ROTOR, DOE Wind Program Subcontractor Review Meeting '98, Boulder, CO, August 5, 1998.

7. RECENT PROGRESS IN AERODYNAMIC RESEARCH: 1. IN-FLIGHT MEASURED BOUNDARY-LAYER STATE CHANGES ON HIGH-LIFT SYSTEMS, 2. CFD-BASED DRAG PREDICTION,
   CIRA - The Italian Aerospace Research Center, Capua, Italy, September 2, 1998.

8. REMOTE IN-FLIGHT BOUNDARY LAYER TRANSITION VISUALIZATION USING INFRARED THERMOGRAPHY,
   8th International Symposium on Flow Visualization, Sorrento, Italy, September 3, 1998.

9. POTENTIAL OF CFD TO IMPROVE ENGINEERING METHODS,
   Science Panel to review test of NREL research wind turbine in the NASA Ames 80' x 120' wind tunnel, Boulder, CO, October 6, 1998.

10. DESIGN TOOLS FOR HIGH-LIFT SYSTEMS ON SUBSONIC CIVIL TRANSPORT AIRCRAFT,
    NASA Ames Research Center, Moffett Field, CA, November 2, 1998.

11. DESIGN TOOLS FOR HIGH-LIFT SYSTEMS ON SUBSONIC CIVIL TRANSPORT AIRCRAFT,
    Boeing Commercial Airplane Group, Everett, WA, November 12, 1998.

12. DESIGN TOOLS FOR HIGH-LIFT SYSTEMS ON SUBSONIC CIVIL TRANSPORT AIRCRAFT,
    NASA Langley Research Center, Hampton, VA, November 19, 1998.

13. IMPROVED HIGH-LIFT SYSTEM DESIGN METHODOLOGY,

Department of Aerospace Engineering, Penn State University, March 31, 1999.

14. PREDICTION OF FLOWS ABOUT FOREBODIES AT HIGH-ALPHA DYNAMIC CONDITIONS,
NASA Langley Research Center, Hampton, VA, September 10, 1999.

15. AERO-MECHANICAL DESIGN METHODOLOGY FOR SUBSONIC CIVIL TRANSPORT HIGH-LIFT SYSTEMS,
NATO RTA/AVT Symposium on Aerodynamic Design and Optimization of Flight Vehicles in a Concurrent Multi-Disciplinary Environment, Ottawa, Canada, October 19, 1999.

16. AERO-MECHANICAL DESIGN METHODOLOGY FOR SUBSONIC CIVIL TRANSPORT HIGH-LIFT SYSTEMS,
Department of Aerospace and Mechanical Engineering, Notre Dame, December 7, 1999.

17. DESIGN ISSUES RELATED TO HIGH-LIFT SYSTEMS ON TRANSPORT AIRCRAFT,
Local AIAA Student Section, UC Davis, January 27, 2000.

18. COMPUTATIONAL STUDY OF FLOWS ABOUT FOREBODIES AT HIGH-ALPHA DYNAMIC CONDITIONS,
NASA Langley Research Center, April 28, 2000.

19. HIGH-LIFT DESIGN METHODOLOGY FOR SUBSONIC CIVIL TRANSPORT AIRCRAFT,
Boeing Commercial Airplane Group, Everett, WA, May 3, 2000.

20. DIMENSIONAL ANALYSIS,
Ecology ECL 203 seminar, UC Davis, May 8, 2000.

21. AERO-MECHANICAL DESIGN METHODOLOGY FOR SUBSONIC CIVIL TRANSPORT HIGH-LIFT SYSTEMS,
NASA Langley Research Center, Hampton, VA, September 25, 2000.

22. PRESENT PROJECTS AND RESEARCH EFFORTS OF THE AERO DESIGN GROUP,
Seminar, Lawrence Livermore National Laboratories, Livermore, CA, December 12, 2000.

23. ACTIVE LOAD CONTROL USING MEM TRANSLATIONAL TABS,
Seminar, Wind Energy Group, Sandia National Laboratories, Albuquerque, NM, February 26, 2001.

24. PREDICTION OF FLOWS ABOUT FOREBODIES AT HIGH-ANGLE-OF-ATTACK DYNAMIC CONDITIONS,
NATO RTA/AVT Symposium on Vortex Flow and High Angle of Attack, Loen, Norway, May 10, 2001.

25. PREVIOUS SUPERSONIC LAMINAR FLOW FLIGHT TEST EXPERIENCE,
DARPA Supersonic Laminar Flow Workshop, Valencia, CA, July 11, 2001.

26. COMPUTATIONAL AEROACOUSTICS FOR HELICOPTER ROTORS,

Workshop on Fundamentals of Aeroacoustics with Applications to Wind Turbine Noise, National Renewable Energy Laboratory (NREL), National Wind Technology Center (NWTC), Golden, CO, July 25, 2001

27. SIMULATION OF FOREBODY FLOW AT HIGH-ANGLE-OF-ATTACK DYNAMIC CONDITIONS,
Seminar, NASA Langley Research Center, Hampton, VA, September 7, 2001

28. WINDPACT BLADE SYSTEM DESIGN STUDIES – SOME AERODYNAMIC DESIGN CONSIDERATIONS,
DOE contract review at TPI Composites, Warren, RI, October 23, 2001.

29. RESEARCH ACTIVITIES IN WIND ENERGY: MEMS, BLUNT TRAILING-EDGE AIRFOILS, WIND TURBINE BLADE-TOWER INTERACTION, Seminar, Department of Mechanical and Aeronautical Engineering, UC Davis, November 1, 2001

30. ACTIVE AERODYNAMIC LOAD CONTROL USING MEM TRANSLATIONAL TABS,
Seminar, Institute for Wind Energy, Delft University of Technology, December 14, 2001.

31. ACTIVE AERODYNAMIC LOAD CONTROL USING MEM TRANSLATIONAL TABS,
Seminar, Energy Commission Netherlands (ECN), December 17, 2001.

32. AERODYNAMIC SIMULATION OF AIRCRAFT AT DYNAMIC FLOW CONDITIONS,
Seminar, NASA Langley Research Center, January 28, 2002.

33. WIND ENERGY,
Lecture in MPS 001, Science in the News, UC Davis, May 6, 2002.

34. WIND ENERGY: EXPLANATION AND ISSUES,
Presentation to Dixon Rotary Club, October 2, 2002.

35. CALIFORNIA WIND ENERGY CONSORTIUM,
Presentation at PIER Review, California Energy Commission, October 25, 2002.

36. ADVANCED CONFIGURATION AERONAUTICS,
Local AIAA Student Section, UC Davis, October 31, 2002.

37. AIRCRAFT DESIGN AND THE IMPORTANCE OF DRAG PREDICTION,
Lecture, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, Rhode Saint Genèse, Belgium, February 3, 2003.

38. CRITICAL FACTORS IN CFD-BASED DRAG PREDICTION,
Lecture, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, Rhode Saint Genèse, Belgium, February 3, 2003.

39. BOUNDARY LAYER PREDICTION AND ITS PREDICTION,
Lecture, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, Rhode Saint Genèse, Belgium, February 5, 2003.

40. ACTIVE LOAD CONTROL THROUGH MEMS-BASED TRAILING EDGE TABS,
Seminar, Sandia National Laboratories, Albuquerque, NM, April 23, 2003

41. WIND ENERGY: EXPLANATION AND ISSUES,
Lecture in MPS 001, Science in the News, UC Davis, May 12, 2003.

42. LOW REYNOLDS NUMBER AERODYNAMICS AS APPLIED TO HIGH ALTITUDE FLIGHT,
Seminar, Lawrence Livermore National Laboratories, Livermore, CA, June 12, 2003.

43. CFD SIMULATION OF AIRCRAFT IN CONING MOTION,
Presentation, NASA Symposium and Computational Methods for Stability and Control (COMSAC), Hampton, VA, September 24, 2003

44. AIRCRAFT DESIGN AND THE IMPORTANCE OF DRAG PREDICTION,
Lecture, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, Hampton, VA, November 3, 2003.

45. CRITICAL FACTORS IN CFD-BASED DRAG PREDICTION,
Lecture, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, Hampton, VA, November 3, 2003.

46. BOUNDARY LAYER PREDICTION AND ITS PREDICTION,
Lecture, Von Karman Institute for Fluid Dynamics Lecture Series on *CFD-Based Aircraft Drag Prediction and Reduction*, Hampton, VA, November 5, 2003.

47. AIRFOILS FOR STRUCTURES: PASSIVE AND ACTIVE LOAD CONTROL FOR WIND TURBINE BLADES,
Presentation, Wind Turbine Blade Workshop, Albuquerque, NM, February 25, 2004.

48. WIND POWER: NEW DEVELOPMENTS,
Presentation, Energy Out West 2004 Conference, Sacramento, CA, April 8, 2004

49. DRAG PREDICTION AND DECOMPOSITION FOR WINGS,
Seminar, Boeing Commercial Airplane Group, Renton & Everett, WA, April 13, 2004

50. BLADE AERODYNAMICS,
Presentation, Wind Power - GCEP Energy Workshop, Stanford University, April 26, 2004 (invited)

51. PASSIVE AND ACTIVE LOAD CONTROL FOR WIND TURBINE BLADES,
Seminar, Goodrich Corporation, Burnsville, MN, May 21, 2004 (invited)

52. WING DRAG PREDICTION AND DECOMPOSITION,
Presentation, AIAA Applied Aerodynamics Conference, Providence, RI, August 17, 2004

53. INNOVATIVE STRUCTURAL AND AERODYNAMIC DESIGN APPROACHES FOR LARGE WIND TURBINE BLADES,
Presentation, AIAA Aerospace Sciences Meeting, Reno, NV, January 12, 2005

54. DEVELOPMENTS IN WIND POWER TECHNOLOGY,
Presentation, Shanghai Forum 2005, Shanghai, China, May 17, 2005 (invited)

55. DEVELOPMENTS IN WIND ENERGY,
Presentation, Roundtable discussion with Congressman Mike Thompson, Shaping our Energy Future, UC Davis, August 31, 2005 (invited)

56. STUDY OF ACTIVE CONTROL FOR WIND TURBINE BLADES,
Seminar, Sandia National Laboratories, Albuquerque, NM, September 1, 2005 (invited)

57. WIND POWER TECHNOLOGY – A STATUS REVIEW,
Panel presentation, IASTED International Conference on Power & Energy Systems, Marina del Rey, CA, October 25, 2005 (invited)

58. RACE CAR AERODYNAMICS,
Seminar, Jim Russell Racing School, Infineon Raceway, Sonoma, CA, November 16, 2005 (invited)

59. RANS ANALYSIS OF AN INBOARD FLATBACK MODIFICATION TO THE NREL PHASE VI ROTOR,
Presentation, AIAA Aerospace Sciences Meeting, Reno, NV, January 9, 2006

60. APPROACHES FOR PERFORMANCE PREDICTIONS OF BLADES WITH EMBEDDED ACTUATORS USING CFD
Presentation, Sandia Blade Workshop, Albuquerque, NM, April 18, 2006 (invited)

61. BSDS PHASE II: FLATBACK AIRFOIL RESEARCH,
Presentation, Sandia National Laboratories, Albuquerque, NM, May 18, 2006

62. AERODYNAMIC DESIGN AND ANALYSIS OF INNOVATIVE WIND TURBINE BLADES,
Presentation, AWEA Windpower 2006, Pittsburgh, PA, June 7, 2006

63. WIND ENERGY: CHALLENGES AND OPPORTUNITIES
Seminar, HP, Roseville, CA, 12 July 2006 (invited)

64. WIND ENERGY: CHALLENGES AND OPPORTUNITIES
Seminar, Energy: Today and in the Future, Modesto Junior College, September 20, 2006 (invited)

65. RACE CAR AERODYNAMICS,
Seminar, Jim Russell Racing School, Infineon Raceway, Sonoma, CA, October 4, 2006 (invited)

66. WIND ENERGY: CHALLENGES AND OPPORTUNITIES
Seminar, ITS, UC Davis, 11 October 2006

67. STUDY OF ACTIVE LOAD CONTROL FOR WIND TURBINE BLADES,
Presentation, Sandia National Laboratories, Albuquerque, NM, October 25, 2006

68. AIRPLANE DESIGN,
Seminar, Introduction to Aerospace Science Engineering, December 4, 2006

2007 69. COMPUTATIONAL INVESTIGATON OF DELPLOYING LOAD CONTROL MICROTABS ON A WIND TURBINE AIRFOIL,
Presentation, 45th AIAA Aerospace Sciences Meeting, Reno, NV, January 10, 2007

70. ALTERNATIVE ENERGY SYSTEMS,
Invited presentation, Engineering Globalization: Bringing the World Together, SWE Region A Conference, San Jose, CA, March 3, 2007

71. HIGH LIFT AND WIND ENERGY,
Invited presentation, Electric Airplane Symposium, Westin Hotel, SFO, May 23, 2007

72. CHALLENGES AND INNOVATION IN WIND ENERGY,
Invited presentation, CleanTech 2007, Santa Clara Convention Center, CA, May 24, 2007

73. ACTIVE LOAD CONTROL OF WIND TURBINE BLADES USING SMALL TABS OR FLAPS,
Presentation, AWEA Windpower 2007, Los Angeles, CA, June 6, 2007

74. RACE CAR AERODYNAMICS,
Invited seminar, Jim Russell Racing School, Infineon Raceway, Sonoma, CA, August 22, 2007.

75. COMPUTATIONAL INVESTIGATIONS OF SMALL TABS AND FLAPS FOR AERODYNAMIC LOAD CONTROL,
Presentation, *The Science of making Torque from Wind*, TU Denamrk, Denmark, August 2, 2007

76. STUDY OF ACTIVE LOAD CONTROL FOR WIND TURBINE BLADES AND RELATED WORK,
Invited presentation, Sandia National Laboratories, Albuquerque, NM, October 30, 2007.

77. WAKE-BASED AERODYNAMIC FORCE EVALUATION FOR CFD VERIFICATION AND DRAG DECOMPOSITION,,
Invited presentation, *Computational Uncertainty in Vehicle Design*, RTO AVT-147, Athens, Greece, December 4, 2007.

2008 78. WIND ENERGY FOR IRIGATION PUMPING:
Invited presentation, *Irrigation and Nutrient Management Meeting*, Salinas, CA, February 26, 2008.

79. WIND ENERGY: A TECHNOLOGY AND INDUSTRY OVERVIEW,
Invited panel presentation, *SWE Region A Conference*, Reno, NV, March 2, 2008

80. WIND-BASED ELECTRIC POWER GENERATION: STATUS, OUTLOOK, ISSUES, OPPORTUNITIES,
Invited seminar, Haas School of Business, UC Berkeley, March 17, 2008.

81. DESIGN SPACE FOR EFFICIENT AIRCRAFT,
Invited presentation, *2nd Electric Airplane Symposium*, Westin Hotel, SFO, April 26, 2008

82. VARILOAD – ACTIVE LOAD CONTROL FOR WIND TURBINE BLADES,
Invited presentation, Frontier Wind, Sacramento, CA, May 7, 2008.

83. OVERVIEW OF ACTIVE LOAD CONTOL R&D
Invited presentation, IEA RD&D Wind, Task 11, *The Application of Smart Structures for large Wind Turbine Rotor Blades*, Albuquerque, NM, May 8-9, 2008

84. RESEARCH ON THICK BLUNT TRAILING EDGE WIND TURBINE AIRFOILS,
Invited presentation, *2008 Wind Turbine Blade Workshop*, Sandia National Laboratories, Albuquerque, NM, May 12-14, 2008.

85. RACE CAR AERODYNAMICS,
Invited seminar, Jim Russell Racing School, Infineon Raceway, Sonoma, CA, May 14, 2008.

86. WIND AT COMMUNITY AND BUILDING/RESIDENTIAL SCALE,
Invited presentation, *Integrated Energy Policy Report Workshop – Emerging Technologies for the Integration of Renewables*, California Energy Commission, 31 July 2008.

87. WIND ENERGY: A TECHNOLOGY AND INDUSTRY OVERVIEW,
Invited presentation, *High Sierra Energy Summit*, Mammoth Lakes, CA, August 13, 2008

88. WIND ENERGY,
Invited presentation, *Energy Prospects in a Changing World*, California Academy of Sciences, San Francisco, September 13, 2008.

89. ADVANCED WIND POWER TECHNOLOGIES,
Invited seminar, *DNV Technology Innovations Program*, Center for Executive Development, Haas School of Business, UC Berkeley, September 25, 2008.

90. RENEWABLE POWER SOURCES: WIND,
Invited seminar, *Statoil Hydro Project Executives Program*, Center for Executive Development, Haas School of Business, San Francisco, October 23, 2008.

91. WIND ENERGY GROWTH: WHERE DO WE FIND THE TRAINED PEOPLE TO DO THE GROWTH,
Invited presentation, *CalWEA Annual Meeting*, October 23, 2008.

92. RENEWABLE POWER SOURCES: WIND,
Invited seminar, *Renewable Energy Speaker Series*, Haas School of Business, UC Berkeley, November 8, 2008.

93. RENEWABLE POWER SOURCES: WIND,
Seminar, *Mechanical Engineering*, UC Davis, November 10, 2008.

2009 94. CALIFORNIA WIND ENERGY COLLABORATIVE,
Invited presentation*, Asia Pacific Partnership Wind Electric Generation Event*, San Francisco, March 2-6, 2009.

94. RACE CAR AERODYNAMICS,
Invited seminar, Jim Russell Racing School, Infineon Raceway, Sonoma, CA, March 19, 2009.

95. UTILITY-SCALE WIND ENERGY,
Invited seminar, *Energy, Sustainability and Business Innovation*, Haas School of Business, UC Berkeley, April 7, 2009.

96. RECHARGING YOUR ELECTRIC AIRCRAFT WITH RENEWABLE ENERGY,
Invited presentation, *3rd Electric Airplane Symposium*, Hiller Aviation Museum, San Carlos, April 24, 2009.

98. WIND ENERGY: STATUS, CHALLENGES, OPPORTUNITIES,
Invited seminar, *Solar and Wind Energy Project*, Stanford University, May 20, 2009

99. WIND ENERGY: STATUS, CHALLENGES, OPPORTUNITIES,
Keynote presentation, *Introduction to Wind Power Systems: Technology & Economics*, Texas Tech University, Lubbock, TX, June 12, 2009.

100. SMALL WIND PERMITTING STUDIES,
Presentation*, California Energy Commission Small Wind Workshop*, Sacramento, CA, July 21, 2009.

101. WIND TURBINE BLADE SECTION ANALYSIS,
Presentation, Sandia National Laboratories, Albuquerque, NM, September 10, 2009.

102. HYDRO TURBINE BLADE DESIGN AND ANALYSIS: A PROGRESS REPORT,
Presentation, Sandia National Laboratories, Albuquerque, NM, September 11, 2009.

103. CALIFORNIA RENWABLE ENERGY COLLABORATIVE KICKOFF MEETING: WIND,
Presentation, UC Davis, September 28, 2009.

104. WIND TURBINE AND BLADE TECHNOLOGY DEVELOPMENTS,
Invited seminar, *Women of Wind Energy*, San Francisco Bay Area Chapter Fall Event, Berkeley, CA, September 30, 2009

105. WIND ENERGY: STATUS, CHALLENGES, OPPORTUNITIES,
Invited seminar, *Renewable Energy Speakers Series*, Haas School of Business, UC Berkeley, November 4, 2009.

106. WIND TURBINE ROTOR FRAGMENT RISK ANALYSIS,
Presentation, *Society for Risk Analysis Annual Meeting*, Baltimore, MD, December 8, 2009

2010 107. OVERVIEW OF UC DAVIS CAPABILITIES AND PLANS,
Invited presentation, *Marine Hydrokinetic Device Research Kickoff Meeting*, Sandia National Laboratories, Albuquerque, NM, January 26, 2010.

108. ON THE SENSITIVITY OF THICK AIRFOILS TO SURFACE SOILING,
Invited seminar, Applied Research Laboratory, State College, PA, March 1, 2010.

109. WIND ENERGY: STATUS, CHALLENGES, OPPORTUNITIES,
Invited presentation, *NASA Internal Workshop on Wind Power Capabilities*, NASA GRC, March 18, 2010.

110. ALTERNATE AVENUES IN WIND TURBINE ROTOR DESIGN,
Invited Seminar, Texas A&M University, College Station, TX, April 1, 2010.

111. ADVANCED WIND POWER TECHNOLOGIES,

Invited seminar, *DNV – UC Berkeley Top Tech Program 2009 – 2010,* Center for Executive Development, Haas School of Business, UC Berkeley, April 19, 2010.

112. OVERVIEW OF WIND ENERGY RELATED ACTIVITIES AT UNIVERSITY OF CALIFORNIA – DAVIS,
Presentation to Committee on Energy Efficiency and Renewable Energy of Guangxi Zhuang Autonomous Region of PRC, UC Davis, April 26, 2010.

113. RESEARCH IN WIND TURBINE ROTOR DESIGN,
Presentation*, 7th California Wind Energy Collaborative Forum*, UC Davis, May 10, 2010.

114. WIND TURBINE ROTOR RD&D,
Invited panel presentation, *Turbo Expo 2010*, Glasgow, UK, June 16, 2010.

115. THICK AIRFOILS WITH BLUNT TRAILING EDGE FOR WIND TURBINE BLADES,
Presentation, *Turbo Expo 2010*, Glasgow, UK, June 17, 2010.

116. A FOCUS ON THE FLOW IN THE INBOARD PART OF THE BLADE,
Invited presentation, *Wind Turbine Blade Workshop*, Albuquerque, NM, July 21, 2010.

117. RESEARCH ON WIND POWER IN THE BUILT ENVIRONMENT,
Invited presentation, *Rooftop & Built Environment Wind Energy Workshop*, NREL, NWTC, August 11, 2010.

118. EDUCATION IN SUPPORT OF THE WIND ENERGY INDUSTRY IN CALIFORNIA,
Invited panel presentation, *Best Practices in Wind Energy: Pathways to Developing a Sustainable Workforce*, Austin, TX, September 8, 2010.

119. APPLICATION OF OVERSET GRID METHODS TO WIND TURBINE ROTORS,
Keynote, *2010 Overset Grid Symposium*, NASA Ames Research Center, Moffett Field, CA, September 22, 2010.

120. IMPROVEMENTS IN THE AERODYNAMIC DESIGN OF WIND TURBINE BLADES: A PROGRESS REPORT,
Presentation, Sandia National Laboratories, Albuquerque, NM, October 5, 2009.

121. TECHNOLOGY EVO/REVO-LUTION IN AIRCRAFT AERODYNAMICS,
Invited Presentation, *Aviation Unleashed Conference*, Hampton, VA, October 19, 2010.

RANDAL VAN ESS

PROJECT ENGINEER

YEARS OF EXPERIENCE
10

EDUCATION
> B.S., Electrical Engineering, California State Polytechnic, 2000

AREAS OF EXPERTISE
> Conceptual design
> Physical detailed design
> Electrical design
> Quality assurance/quality control
> Estimating
> Procurement
> Installation and commissioning of electrical components
> Installation and commissioning of project control systems
> Incident analysis investigation
> AutoCAD proficiency

LICENSING
> Engineer in Training: California

EXPERIENCE SUMMARY

Mr. Van Ess brings a solid background of engineering experience for projects involving substation, generation and transmission system interface as well as project control systems. As a project engineer he is responsible for all aspects of his projects from concept to commissioning. He regularly performs conceptual design, physical and electrical detailed design, quality assurance and quality control, vendor support, construction support and some project management duties. In addition to engineering, Mr. Van Ess is experienced in vendor surveillance and quality assurance inspections. He is skilled in incident analysis investigation, root cause determination and reporting for these incidents. Mr. Van Ess is a department manager responsible for the day-to-day operations of the San Diego substation department for POWER Engineers.

City of Riverside, Transmission Reliability Project-Phase II Engineering, California

Project Engineer for the Wilderness, RERC, Riverside, Mountain View, Springs, and Hunter substations. Responsible for interpreting design input from the client and ensuring this information is incorporated into the design documents, overseeing all production efforts, and providing technical vendor evaluation and guidance. Responsible for substation project management, reporting and controls. POWER is providing engineering and construction support services for the Riverside Transmission Reliability Project (RTRP), a major upgrade to the City of Riverside's electric system. Phase two will provide the city with environmental clearances, substation and transmission line design, and construction of 230 kV and 69 kV systems. POWER is providing conceptual and detailed engineering for two new substations, four new double circuit 69 kV transmission line segments; and upgrades to eight existing 69 kV substations.

City of Riverside, Riverside Transmission Reliability Project-Phase I, California

Project Engineer for the project definition phase for a proposed new 230 kV interconnection into the Southern California Edison (SCE) transmission system. Worked with studies and transmission groups to generate conceptual designs for nine substations. Generated and refined general arrangement drawings for the new 220 kV and 69 kV substations. Performed rough civil and substation engineering required to support the conceptual design and site development. Generated construction estimates for all 69 kV substations in project. The Riverside Transmission Reliability Project (RTRP) includes a new 230 kV transmission line, new 230 kV substation, 69 kV tie lines to the Riverside Public Utilities electrical grid and electrical upgrades to existing 69 kV lines and substations within Riverside's electrical system. POWER provided project scoping, conceptual engineering and permitting services.

City of Vernon, Matheson Tri-Gas 66 kV Switching Station, California

Project Engineer responsible for proposal, invoicing, design oversight, high level customer interface and QA/QC. POWER provided design for physical, civil, structural and electrical aspects of the project. The project included a two terminal, radially fed switching station with one breaker, switches and metering for a new facility substation.

City of Vernon, Pabco Transformer & Bus Replacement, California

Project Engineer responsible for overseeing physical and electrical design. POWER provided design for electrical, civil, structural and physical aspects of the project. The project involved replacement of aged 16-7 kV, 3.75 MVA transformers with two new 16 kV-480 V, 5MVA transformers. Metering, SPCC, oil containment and busing were included.

Mitsubishi Electric Power Products, Barrow County Substation SVC, Georgia

Lead Electrical Engineer responsible for electrical design of the project. POWER was engineering subcontractor for the EPC installation of the Barrow County static var compensator (SVC) for the Georgia Transmission Corporation. The SVC interfaces with Georgia Power's Winder Primary 230/115/46/25/12 kV substation and is connected by a one-third mile 230 kV transmission line. The SVC provides 0 to +260 Mvar continuous compensation. POWER's scope included physical arrangement, busing, foundation, structures, static protection, lighting, grounding, protection and control, wiring, control shelter, station service, relay settings, testing and commissioning, and fiber optic communications.

Mitsubishi Electric Power Products, Rector Substation SVC, California

Project Engineer for the installation of a static var compensator (SVC) at Southern California Edison's Rector Substation. Responsible for electrical interface for design of protection schemes. Helped define single-line diagrams, current schematics, potential schematics, DC control schematics, building bid package, and panel bid packages. Worked closely with SCE, the EPC contractor, the power electronics provider (Mitsubishi Electric, Japan), and equipment vendors to ensure proper integration of equipment into the California power transmission system using SCE standard practices. POWER was a subcontractor to Mitsubishi Electric Power Products, the EPC contractor. The new system provides -120 to +200 Mvar continuous compensation. POWER's scope included complete physical arrangement, busing, foundation, structures, static protection, lighting, grounding, protection and control, wiring, control shelter, station service, relay settings, testing and commissioning, and fiber optic communications with SCE.

Mitsubishi Electric Power Products, St. George 138 kV Substation SVC Upgrade, Utah

Project Engineer responsible for electrical design for a project to design the interface of the St. George 138 kV Substation to a Mitsubishi-designed,

thyristor-controlled, reactive compensation system SVC for PacifiCorp. Generated single-line diagrams, current schematics, potential schematics, DC control schematics, building bid package, and panel bid packages. Worked closely with PacifiCorp, the EPC contractor, the power electronics provider (Mitsubishi Electric, Japan), and equipment vendors in order to ensure proper integration of equipment into the Utah Power transmission system using PacifiCorp standard practices. The new system provides -35 to +100 Mvar continuous compensation and 70 to +278 Mvar transient overload compensation. POWER was a subcontractor to Mitsubishi Electric Power Products, Inc., the EPC contractor. POWER's scope included complete physical arrangement, busing, foundation, structures, static protection, lighting, grounding, protection and control, wiring, control shelter, station service, testing and commissioning, and fiber optic communications with PacifiCorp.

Oncor Electric Delivery, General Services Agreement, Texas

Project Engineer project documentation, detailed design, QA/ QC and project coordination. POWER is working closely with Oncor under a long-term alliance to provide all aspects of transmission and distribution engineering and support services. POWER provides detailed physical, electrical and civil engineering for substations and transmission lines (overhead and underground); material procurement assistance, permitting and construction support services. In addition, POWER assists with the scheduling and coordination of the engineering, material procurement and construction for 150-200 projects per year.

San Diego Gas and Electric, Borrego 69 kV Substation, California

Project Engineer for modifications to Borrego Substation. POWER provided engineering for addition of a new 69-12 kV transformer, 69 kV circuit switchers, 12 kV bank breakers, 12 kV bus protection, annunciator, RTU and modification of protection scheme. The project also included addition of a power transformer load tap changer and design of the paralleling scheme. Scope also included project management, estimating, scheduling, meetings, site visits, engineering and drafting standard adherence, construction support and as-built drawings.

Confidential Client, Transformer Condition Based Maintenance, California

Project Engineer responsible for detail design, quality assurance, and overall project management support. POWER is providing engineering for the electrical design of the condition based maintenance (CBM) systems on bulk transmission and distribution transformer banks. The program will ultimate allow for critical substation equipment to be continuously monitored for efficiency. More than 300 transformers and 100 substations will be installed throughout the course of the project. POWER provided detailed communication design and integration into the client’s existing substation systems. Benefits of the project include standardization of the design process, optimizing assets, reducing risk of failures and sending automatic alerts when maintenance is needed.

Oncor Electric Delivery, West Levee Switching Station, Texas

Project Engineer for a bay addition and infrastructure for the current and future 345 kV underground lines to the West Levee Switching Station. POWER provided engineering services for adding a new 345 kV bay which included structural steel for an underground line termination structure, one 345 kV circuit breaker, 345 kV breaker protection, CCVTs, line trap/tuner, lighting arresters and new RTU. Scope also included estimating, scheduling, meetings, site visits, engineering and drafting standard adherence, construction support and as-built drawings.

Oncor Electric Delivery, Rocky Creek Switching Station, Texas

Project Engineer for establishing a distribution substation at Rocky Creek Switching Station. POWER provided engineering services for adding a new 47MVA distribution substation which included structural steel, one 138 kV circuit breaker, 138 kV breaker protection, 138 kV transformer protection, CCVTs, lighting arresters and a complete 25 kV distribution substation feeder rack. Scope also includes estimating, scheduling, meetings, site visits, engineering and drafting standard adherence, construction support and as-built drawings.

Oncor Electric Delivery, West Roanoke Substation Upgrade, Texas

QA/QC Engineer responsible for physical and electrical design review for line terminal upgrade project. Fault current studies indicated line may become overloaded, necessitating a line terminal upgrade.

Oncor Electric Delivery, South Lufkin Substation Upgrade, Texas

QA/QC Engineer responsible for physical and electrical design review for line terminal upgrade project. Fault current studies indicated line may become overloaded, necessitating a line terminal upgrade. POWER provided engineering services for replacing tone 138 kV circuit breaker, line trap/tuner and lighting arresters.

Oncor Electric Delivery, Waco Woodway Substation Upgrade, Texas

QA/QC Engineer responsible for physical and electrical design review for line terminal upgrade project. Fault current studies indicated line may become overloaded, necessitating a line terminal upgrade.

Oncor Electric Delivery, West Waco Substation Upgrade, Texas

QA/QC Engineer responsible for physical and electrical design review for line terminal upgrade project. Fault current studies indicated line may become overloaded, necessitating a line terminal upgrade.

Oncor Electric Delivery, Handley Substation Upgrade, Texas

QA/QC Engineer responsible for physical and electrical design review for a 138 kV overdutied breaker replacement project. Fault current studies indicated the breaker would be soon overdutied necessitating replacement.

Oncor Electric Delivery, East Levee Substation Upgrade, Texas

QA/QC Engineer responsible for physical and electrical design review for a 138 kV overdutied breaker replacement project. Fault current studies indicated the breaker would be soon overdutied necessitating replacement

Oncor Electric Delivery, West Levee Substation Upgrade, Texas

QA/QC Engineer responsible for physical and electrical design review for a 138 kV overdutied breaker replacement project. Fault current studies indicated the breaker would be soon overdutied necessitating replacement

PREVIOUS WORK HISTORY

Progress Energy Ventures, Richmond Energy Complex, Phase II, North Carolina

Mr. Van Ess was a Project Engineer for this 500 MW Combined Cycle and 180 MW Simple Cycle, Gas Turbine project. His responsibilities included estimating major electrical and control system equipment and subcontracts, guiding the design process to guarantee successful contract implementation, issuing RFP's for engineered equipment and electrical subcontracts and technical evaluation of proposals and insuring engineered equipment is purchased, manufactured, tested, delivered, and commissioned as designed. He was also responsible for identifying, resolving, and documenting all electrical problems that arise, including customer concerns, equipment failures, and abnormal operation. He also developed customer interface and primary utility interface on an engineering level.

Progress Energy Ventures, Effingham County Power, LLC, Georgia

Mr. Van Ess was a Project Engineer for this 500 MW Combined Cycle gas turbine project. His responsibilities included estimating major electrical and control system equipment and subcontracts, guiding the design process to guarantee successful contract implementation, issuing RFP's for engineered equipment and electrical subcontracts and technical evaluation of proposals and insuring engineered equipment is purchased, manufactured, tested, delivered, and commissioned as designed. He was also responsible for identifying, resolving, and documenting all electrical problems that arise, including customer concerns, equipment failures, and abnormal operation. He also developed customer interface and primary utility interface on an engineering level.

Progress Energy Ventures, Rowan County Power, LLC, North Carolina

Mr. Van Ess was a Project Engineer for this 500 MW combined cycle gas turbine project. His responsibilities included estimating major electrical and control system equipment and subcontracts, guiding the design process to guarantee successful contract implementation, issuing RFP's for engineered equipment and electrical subcontracts and technical evaluation of proposals and insuring engineered equipment is purchased, manufactured, tested, delivered, and commissioned as designed. He was also responsible for

identifying, resolving, and documenting all electrical problems that arise, including customer concerns, equipment failures, and abnormal operation. He also developed customer interface and primary utility interface on an engineering level.

Progress Energy Ventures and Savannah Electric Power Company, Blandford Substation, Georgia

Mr. Van Ess was a Project Engineer for this fully automated, 5 Circuit, Ring-bus substation. His responsibilities included estimating major electrical and control system equipment and subcontracts, guiding the design process to guarantee successful contract implementation, issuing RFP's for engineered equipment and electrical subcontracts and technical evaluation of proposals and insuring engineered equipment is purchased, manufactured, tested, delivered, and commissioned as designed. He was also responsible for identifying, resolving, and documenting all electrical problems that arise, including customer concerns, equipment failures, and abnormal operation. He also developed customer interface and primary utility interface on an engineering level.

W. DAVID WARDALL
17069 Lambert Road
Ione, CA 95640
209-274-9160

Retired, Consulting Aerospace Engineer 2009-2010

Chief, Aircraft Maintenance and Engineering 1996- 2008
California Department of Forestry and Fire Protection (CAL FIRE)

Plan, organize and direct the aircraft Maintenance and Engineering Program for CAL FIRE. Responsible 24/7 for 55 fire fighting aircraft. Hold FAA Director of Maintenance position for fleet of aircraft.

- Directly administer $20 million budget for aircraft maintenance and engineering
- Supervise management staff of four aircraft maintenance managers
- Supervise depot level and field assigned maintenance work force of 80 technicians
- Manage FAA Repair Station Certificate with several class ratings
- As an FAA DER, design and approve major modifications and major repairs
- Hold and maintain three FAA type certificates for fire fighting aircraft
- In-house manufacture a wide variety of aerospace parts and components
- Act as pilot-in-command for VIP flights for Governor and cabinet staff
- Perform maintenance test flights on transport class airtankers

Deputy Chief, Research and Development 1995-1996
California Department of Forestry and Fire Protection (CDF)

Plan, organize and direct the Research and Development program. Plan and submit Federal Grant funding request to obtain, at no cost to State, a high altitude, high performance turbine powered aircraft. Retrofit and install an infrared real time fire mapping system.

- Develop real time live down-link fire mapping program with several map overlays
- Manage all field and depot level maintenance through specialized service contracts
- Design and approve as an FAA DER structures engineer, infrared sensor installation
- Design and approve as an FAA DER, integrated cabin equipment and consoles
- Oversee and manage all aircraft engineering major modifications and repairs
- Fly aircraft as fire mapping airplane and for VIP transport of Governor and staff
- Fly transport class airtankers for maintenance evaluation test flights

Deputy Chief, Airplane Program 1990-1995
California Department of Forestry and Fire Protection (CDF)

Plan, organize and direct CDF Airplane Program. Responsible 24/7 for 23 airtankers, 15 observation aircraft and 5 support aircraft deployed to 13 airtanker bases and a major depot level maintenance facility.

- Directly administer $6 million budget for airplane program
- Supervise management staff of two aircraft maintenance managers
- Supervise two chief pilots, airtankers and observation airplanes
- Supervise 50 line airtanker and observation aircraft pilots
- Supervise depot level and field assigned maintenance work force of 65 technicians

W. David Wardall

- As an FAA DER, design and approve major modifications and major repairs
- Act as pilot-in-command for VIP flights for Governor and cabinet staff
- Perform maintenance and test flights on Transport class airtankers

Manager, Aircraft Maintenance and Engineering 1977-1990
California Department of Forestry and Fire Protection (CDF)

Supervise the contracted maintenance of 51 Department aircraft. Responsible 24/7 for the maintenance of 19 airtankers, 16 observation aircraft, 12 helicopters and four support airplanes.

- Directly administer $10 million budget for aircraft maintenance and engineering
- Supervise management staff of three aircraft maintenance managers
- Supervise depot level and field assigned maintenance work force of 60 technicians
- As an FAA DER, design and approve major modifications and major repairs
- Hold and maintain two FAA type certificates for fire fighting aircraft
- Act as pilot-in-command for VIP flights for Governor and cabinet staff
- Perform maintenance and test flights on Transport class airtankers

Aviation Consultant and Airport Inspector 1974-1977
California Department of Aeronautics

Manage the contracted maintenance of Department aircraft. Inspect airports for permit issuance and airport safety considerations.

- Inspect Department aircraft for airworthiness
- Prepare maintenance bid specifications; bid, award and monitor contracts
- Inspect airports and heliports for license and construction standards
- Evaluate and award State and FAA grants for airport construction
- Fly Department aircraft as pilot-in-command

Airframe Systems Engineer 1973-1974
Lockheed Aircraft Corporation

Employed in the Field Service Department. Assist and advise airline customer personnel in the inspection, maintenance and operation of the L-1011 jet transport.

- Develop customer relations to improve maintenance and operation of the L-1011
- Maintain a close liaison with factory engineering on operations of the plane
- Investigate and report on accidents, incidents and service problems
- Inspect unserviceable removed parts to determine cause of failure and warranty

Associate Production Engineer 1971-1972
Lockheed Aircraft Corporation

Design modifications and repairs to the L-1011 jet transport resulting from manufacturing damage and blue print errors.

- Respond to production line floor and design repairs to shop errors and damage

W. David Wardall

- Investigate drawing errors and design revisions to drawings
- Inspect aircraft in final assembly and flight line for conformity to engineering drawings

CERTIFICATES/ RATINGS/ LICENSES

FAA Airline Transport Pilot, several type ratings
FAA Flight Engineer, Turbo Jet, L-1011
FAA Flight Instructor, Airplane Single & Multi-Engine Land
FAA Flight Instructor, Instruments
FAA Designated Engineering Representative, (DER), Structures, Parts 23, 25, 27 & 29
FAA Airframe and Powerplant Technician with Inspection Authorization (IA)
Holder of Three FAA Aircraft Type Certificates
Holder of FAA Part 145 Repair Station Certificate

PROFESSIONAL EDUCATION AND TRAINING

Academic:	BS Aeronautical Maintenance, San Jose State University, 1971 MS Aviation Safety, USC, several classes completed
Professional:	Aviation Safety Officer, USC, Los Angeles, CA, 1979 Gas Turbine Accident Investigation, USC, Los Angeles, CA, 1995 Senior Level Aviation Management, US Forest Service, 1985 Techniques of Supervision “A” & “B”, State of California, 1989 Type Ratings and recurrent training, Flight Safety International Factory schools: Bendix, Bell Helicopter, Allison, Lockheed, Garrett, etc.

ACHIEVEMENTS

Dean’s Scholar, School of Engineering, Dept. of Aeronautics, San Jose State University, 1971
Dean’s List Every Semester, San Jose State University 1970 and 1971
National Aerospace Education Award
Scholarship Achievement Award
Airport Owner / Operator/Manager

Williams Aviation Consultants

Barry A. Yurtis

PROFESSIONAL HISTORY

2007-Present: Williams Aviation Consultants: Vice President of Domestic Operations
Aviation consulting on a broad range of aviation related issues including, but not limited to:

- Accident/incident review and analysis relating to the adequacy of air traffic control services, airspace and air traffic control procedures analysis
- Pilot actions and responsibilities relating to aircraft accidents and incidents
- Environmental analysis as it relates to Environmental Impact Statements concerning Air Traffic Control, Instrument Procedures and aircraft routes
- Advice and counsel to government agencies, cities, corporations, attorneys and individuals on a broad range of technical and regulatory issues including Airport/Airspace Obstruction Analysis relating to FAR Part 77 and Terminal Instrument Procedures (TERPS)
- Expert witness testimony and international aviation master planning and system development

2004-Present: Barry Yurtis & Associates
Aviation consultant in private practice specializing in the review of aircraft accidents and incidents, including the evaluation of air traffic control services, pilot actions and responsibilities and related expert witness testimony.

1994-1997; 2002-2004: FAA Quality Assurance Staff, Safety Manager, Western Terminal Operations, Air Traffic Organization
ATC Subject Matter Expert primarily concerned with measuring the quality and effectiveness of the air traffic control services provided to commercial, private, and military users of the National Airspace System. As Quality Assurance Specialist and Manager from 1994 through 1997, and as Quality Assurance/Safety Manager from 2002 to 2004, duties included:

- Responsibility for Quality Assurance and Safety oversight of 147 terminal (ATCT and TRACON), four ARTCC, and eight AFSS facilities in the Western-Pacific Operations Area (Western USA, Pacific Ocean and Alaska).
- Serving as FAA Regional Air Traffic on-site representative in FAA and National Transportation Safety Board (NTSB) accident and incident investigations involving air traffic control services.
- Reviewing and analyzing air traffic control performance relating to aircraft accidents, near-midair collisions, pilot deviations, runway incursions and operational errors in the ATCT, TRACON, ARTCC, and AFSS environments.

8490 South Power Road, Suite 105-181 ♦ Gilbert, AZ 85297 ♦ Office (480) 987-7823 ♦ Fax (602) 513-7388

- Sampling air traffic services and assessing the efficiency of new and/or current air traffic control procedures, clarity and effectiveness of clearances and instructions, and operational adequacy of flight assistance and aeronautical information services.
- Participating in FAA National Evaluation Branch facility evaluations.
- Providing technical assistance to FAA General and Regional Counsel in litigation matters that involved pilot actions and/or air traffic control issues.

1999-2002: FAA Manager, Los Angeles ARTCC
Responsible for planning and directing all air traffic activities at Los Angeles ARTCC; managed over 400 employees (300 controllers and 100 staff and subordinate managers) and provided management guidance and direction for the application of air traffic control procedures, techniques, and associated functions; also responsible for ensuring the facility was in compliance with all operational, administrative, financial, technical and training requirements, including personnel policies and practices and labor-management relations.

1998: Acting FAA Manager, Reno ATCT/TRACON
Responsible for the daily operations at the combined airport traffic control tower and TRACON; provided management guidance and direction for the application of air traffic control procedures and techniques; responsible for ensuring the facility was in compliance with all operational, administrative, financial, technical, and training requirements, including personnel policies and practices and labor-management relations.

1997-1999: Assistant Air Traffic Manager, Los Angeles ARTCC

1994-1997: FAA Western-Pacific Regional Air Traffic Staff and Manager

- Quality Assurance
- Airspace, Procedures and Military Operations

1975-1985; 1989-1994: Air Traffic Controller, Memphis ARTCC and Los Angeles ARTCC, ARTCC Staff Specialist, Air Traffic Control Supervisor, Los Angeles ARTCC

SYNOPSIS OF EXPERIENCE

Mr. Yurtis' qualifications as an aviation Subject Matter Expert include over 38 years of aviation experience. Included in those are over 25 years of air traffic control experience obtained as a Controller, Staff Specialist, Supervisor, Facility Manager, and Branch Manager with the U.S. Federal Aviation Administration (FAA). He also has vast experience in both civilian and military aviation as a civilian commercial pilot and flight instructor, and as a U.S. Marine Corps Naval Flight Officer. Barry's air traffic experience includes radar and non-radar training and certifications in Air Route Traffic Control Centers (ARTCC), with specific controller experience gained at Memphis ARTCC and Los Angeles ARTCC. In addition, he has broad staff experience in safety, quality assurance, airspace, procedures, and military operations at FAA field facilities and FAA regional headquarters.

As FAA Western-Pacific Regional Air Traffic Quality Assurance/Safety Manager, he conducted hundreds of reviews of air traffic controller and system performance following aircraft accidents, near mid-air collisions, runway incursions, operational errors and pilot deviations. In these reviews, Mr. Yurtis evaluated the quality of air traffic control services provided by Airport Traffic Control Towers (ATCTs), Terminal Radar Approach Control facilities (TRACONs), FAA Air Route Traffic Control Centers (ARTCCs), and Automated Flight Service Stations (AFSSs). These reviews included an assessment of air traffic controller performance, the correct operation of equipment, the adequacy and application of air traffic control procedures and aeronautical information services, the performance of the National Airspace System (NAS) in general and an assessment of pilot actions related to non-compliance with Federal Air Regulations.

As Regional Quality Assurance/Safety Manager, Mr. Yurtis participated in numerous NTSB-led aircraft accident investigations including Korean Air 801 (Guam), Philippine Air 110 (Guam), N146PM/N8604N (North Las Vegas, NV), N304PA (Julian CA), N1828A/N7199U (Carlsbad, CA), N206TV/N442RH (Torrance, CA) and N30DK (San Diego, CA). During his tenure as Los Angeles ARTCC Air Traffic Manager, Mr. Yurtis conducted an independent management review of controller performance following the commercial aircraft accident involving Alaska 231.

Over the rest of his career, Mr. Yurtis participated in numerous evaluations of FAA and military air traffic control facilities, with a focus on air traffic controller performance, airspace utilization, adequacy of procedures, adherence to FAA directives and the efficient and effective collecting, formatting, distribution and retention of aeronautical information. He has held positions as Safety Manager, Western Terminal Operations (formerly Manager, Quality Assurance Staff, FAA Western-Pacific Region), Air Traffic Manager, Los Angeles ARTCC, and Acting Manager, Reno ATCT/TRACON, and notably, was Chairman of the FAA National Terminal Quality Assurance Board. This board's charter was national in scope, and tasked with the integration of quality assurance procedures, practices, and policies into the newly-organized Terminal Operations Division of the Air Traffic Organization. The Board was also tasked with devising and implementing national initiatives for the reduction of the number and severity of operational errors in the terminal environment.

He also has extensive experience in military and commercial civilian aviation. Barry served in the United States Marine Corps as a Naval Flight Officer aboard the A-6 Intruder and as a civilian commercial pilot; logging over 2500 flight hours in single and multi-engine aircraft. He has managed two general aviation Fixed Base Operations (FBOs) and developed an FAR Part 135 (Air Taxi) and 141 (FAA Approved Flight School) Operations Manual for Hart Aviation, while simultaneously procuring operational approvals for both entities. Mr. Yurtis experience includes an FAR Part 135 single-pilot certificate for aircraft commercial charter operations and has held the position of Chief Flight Instructor at FAR Part 141 FAA Approved Flight Schools in both Tennessee and North Carolina.

GENERAL AVIATION EXPERIENCE

Military Flight Experience

United States Marine Corps, 1st Lieutenant, Naval Flight Officer- A-6A Intruder.

- Over 500 hours logged in various military jet and propeller aircraft.

Civilian Pilot Experience

Over 2,100 hours logged in various civilian general aviation aircraft.

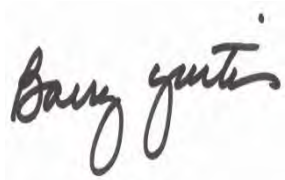
- Certificates and Ratings: Commercial pilot, single and multi-engine land; Instrument rating; Certified Flight Instructor; Multi-engine Instructor; Instrument Instructor; Ground Instructor; Air Taxi, FAR Part 135 single pilot, multi-engine authorization; FAR Part 141 Chief Flight Instructor.

AFFILIATIONS

Air Traffic Controller Association (ATCA)
Aircraft Owners and Pilots Association (AOPA)

EDUCATION

Bachelor of Science Degree, University of Illinois, Champaign-Urbana, 1970
Teaching Credential, Secondary Education



Barry Yurtis January 29, 2010

Fatuma Yusuf, Ph.D.

Socioeconomics

Education

Ph.D., Agricultural Economics
M.S., Statistics
M.A., Agricultural Economics
B.Sc., Range Management

Relevant Experience

Dr. Yusuf is an economist and statistician. She has conducted economic analyses for energy, water supply, water quality, agriculture, transportation, and recreation projects; evaluated project feasibility; and assessed economic impacts associated with project implementation. She has experience in preparing the socioeconomic analysis, regional economic impact analysis, cost-benefit analysis, and rate impact analysis. She has developed statistical predictive models and has evaluated the economic impacts associated with base closures and habitat creation. She has been an economics task lead and task manager for a number of Environmental Impact Statements/Reports (EIS/R) including some on highway development or expansion, high speed rail development, and light rail development.

Representative Projects

Mariposa Energy Project (MEP) Application for Certification (AFC); Mariposa Energy, LLC. Prepared the socioeconomics section for the MEP AFC. The MEP will be a natural gas-fired, simple-cycle generating facility with a nominal capacity of 200-megawatts

Almond 2 Power Plant (A2PP) Application for Certification (AFC); Turlock Irrigation District; Ceres, California. Authored the socioeconomics section for the A2PP AFC. The project consisted of a natural gas-fired, simple-cycle peaking facility rated at a gross generating capacity of 174 megawatts.

Economic Impact Analysis for the Teanaway Solar Reserve, Kittitas County, Washington. Economics Task Lead. Provided screening-level economic, socioeconomic and fiscal impact analyses of the construction and operation associated with the Teanaway Solar Reserve project in Kittitas County, Washington.

Ivanpah Solar Electric Generating System (Ivanpah SEGS), San Bernardino County, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income

Carlsbad Energy Center Project (CECP), Carlsbad, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC for the construction of a combined-cycle facility consisting of two natural-gas-fired turbines, heat recovery steam generators, steam turbine generators, and associated equipment. Also, analyzed the regional economic impacts of the project on employment and income.

GWF Tracy Combined Cycle Power Plant Project (GWF Tracy), Tracy, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Roseville Energy Park, California. Analyzed the regional economic impacts of the project on employment and income.

Lodi Energy Center, NCPA; Lodi, San Joaquin County, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Chula Vista Energy Upgrade Project, MMC Energy, San Diego County, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification, Eastshore Energy Project, Hayward, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification, South Bay Replacement Project, Chula Vista, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Economic Analysis for the Calpine LNG Facility and Power Plant in Eureka, California. Project Manager. Provided screening-level economic, socioeconomic and fiscal impact analyses of the construction and operation associated with the Calpine LNG and Power Plant Projects in Eureka, California.

Socioeconomic Study Plan for the SMUD Upper American River Project Iowa Hill Pumped Storage Development Project. Socioeconomic Task Lead. Prepared the socioeconomic study plan and evaluated the socioeconomic impacts associated with the Iowa Hill Pumped Storage Development Project as part of the SMUD Upper American River Project Hydroelectric FERC relicensing application. Also, analyzed the regional economic impacts of the project on employment and income.

Revision of SMUD Upper American River Project Socioeconomic Impact Study Report. Socioeconomic Task Lead. Prepared Revision 1 of the SMUD UARP Socioeconomic Impact Study Report on the SMUD Upper American River Project Hydroelectric relicensing. Revision 1 involved the verification of the study conducted by CSUS. Also, analyzed the regional economic impacts of the project on employment and income.

Industrial Siting Application for a number of energy projects in Wyoming including the Medicine Bow Coal to Liquid Project, Wygen III Unit 5, Seven Mile Hill and Glenrock Wind Energy Projects. Analyzed the regional economic impacts of the projects on employment and income.

Application for Certification the Walnut Energy Facility in Turlock, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification for Los Esteros Critical Energy Facility, San Jose, California. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification for the San Francisco Electric Reliability Project in San Francisco, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

San Joaquin Valley Energy Center AFC, Calpine Corp., San Joaquin, California (2001 to 2002). Socioeconomics Task Lead**.** Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

East Altamont Energy Center AFC (2001). Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Salton Sea Unit 6 Geothermal Project (2002 to 2003). Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Small Power Plant Exemption for Modesto Irrigation District's Woodland Generation Station Unit II (WGSII), Modesto Irrigation District, Modesto, California (2003 to 2004). Economics Task Lead. Prepared the socioeconomics analysis section of the SPPE.

SMUD Cosumnes Power Plant AFC (2001). Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Klamath Hydroelectric Project Resources Studies and Preparation of Relicensing Documents, PacifiCorp, Upper Klamath River, Oregon and California (2003 to 2004). Prepared the Socioeconomic Resources Final Technical Report in support of the FERC application for a new Project license.

Appendix B
Signed Declarations

APPENDIX B

Signed Declarations

DECLARATION OF
MARK BASTASCH

I, Mark Bastasch, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Technologist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Noise and Vibration for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/13/2010 Signed: _____

At: Portland, Oregon

DECLARATION OF
DAVID BLACKWELL

I, David Blackwell, declare as follows:

1. I am presently employed by the law firm of Allen Matkins Gamble Leck Mallory & Natsis LLP as a partner.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Land Use for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12-17-10 Signed: D. H. Bl

At: Walnut Creek, CA

DECLARATION OF
LOREN BLOOMBERG

I, Loren Bloomberg, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Principal Technologist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Traffic and Transportation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/9/10 Signed: Loren Bloomberg

At: Santa Ana, California

DECLARATION OF
MALY-ANN BORY

I, Maly-Ann Bory, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Staff Engineer.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Traffic and Transportation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/10/2010 Signed: Maly-Ann Bory

At: Oakland, California

DECLARATION OF
TODD ELLWOOD

I, Todd Ellwood, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Scientist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Biological Resources for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 9, 2010 Signed: Todd Ellwood

At: Oakland, California

DECLARATION OF
MATTHEW FRANCK

I, Matthew Franck, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I supervised the preparation of the attached testimony on Water Resources for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/10/10 Signed: MTF

At: Sacramento, California

DECLARATION OF
MARSHALL W. GRAVES, Jr.

I, Marshall W. Graves, Jr., declare as follows:

1. I am presently self-employed as President, International Institute of Aviation, Science and Technology.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Plume effects on Aircraft Loads and Handling Analysis of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 18, 2010 Signed: Marshall W. Graves, Jr.

At: Carmichael, California

DECLARATION OF
JAMES GWERDER

I, James Gwerder, declare as follows:

1. I presently work for A. SOUZA & SON as an employee and Anthony F. Souza dba SOUZA REALTY & DEVELOPMENT as an independent contractor in the capacity of property manager, real estate broker and real estate consultant.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I contributed to the preparation of the attached testimony on the Land Use for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12-21-10 Signed: James A. Gwerder

At: Tracy, California

DECLARATION OF
DEAN HARRIS

I, Dean Harris, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Geotechnical Specialist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I supervised the preparation of and provided senior review for the attached testimony on Geologic Resources for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/18/2010 Signed: Dean Harris

At: Boise, Idaho

DECLARATION OF
CLINT HELTON

I, Clint Helton, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Technologist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Cultural Resources for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 11/13/10 Signed: _____

At: Santa Ana, California

DECLARATION OF
RONALD HESS, PH.D.

I, Ronald Hess, declare as follows:

1. I am presently employed by the University of California as a Professor of Mechanical and Aerospace Engineering.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony (Mariposa Energy Project: Plume Effects on Local Aviation) on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 10 December, 2010 Signed: R C Hess

At: Davis, California

DECLARATION OF
JOSHUA HOHN

I, Joshua Hohn, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as an Associate Planner.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Land Use for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 10, 2010 Signed: Joshua D. Hohn

At: Oakland, California

DECLARATION OF
JOSHUA HOHN

I, Joshua Hohn, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as an Associate Planner.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Visual Resources for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 10, 2010 Signed: Joshua J. Hohn

At: Oakland, California

DECLARATION OF

Jennifer Krenz-Ruark

I, Jennifer Krenz-Ruark, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Scientist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Soils for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/13/2010 Signed: Jennifer Krenz-Ruark

At: Sacramento, California

DECLARATION OF
THOMAS A. LAE

I, Thomas Lae, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I supervised the preparation of and provided senior review for the attached testimony on Geologic Resources for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12-10-10 Signed: T A Lae

At: Sacramento, California

DECLARATION OF
BARBARA LICHMAN, PH.D.

I, Barbara Lichman, declare as follows:

1. I am presently employed by Chevalier, Allen & Lichman, LLP as Managing Partner.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring FAA Jurisdiction Analysis of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/16/10 Signed: Barbara E. Lichman

At: Costa Mesa, CA

DECLARATION OF
ADOLPH MARTINELLI

I, Adolph Martinelli, declare as follows:

1. I am presently employed by Diamond Generating Corporation as an independent land use and government policy consultant.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Land Use for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 15, 2010

Signed: Adolph Martinelli

At: Berkeley, California

DECLARATION OF
KEITH MCGREGOR

I, Keith McGregor, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as an Associate Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Air Quality for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/20/2010 Signed: _____

At: Sacramento, California

DECLARATION OF
KEITH MCGREGOR

I, Keith McGregor, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as an Associate Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Public Health for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/20/2010 Signed: _____

At: Sacramento, California

DECLARATION OF
KEITH MCGREGOR

I, Keith McGregor, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as an Associate Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Katestone Environmental Assessment of Vertical Plume Velocities and the Pilot Exposure Analyses of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/20/2010 Signed: _____

At: Sacramento, California

DECLARATION OF
DOUGLAS MOSS

I, Douglass Moss, declare as follows:

1. I am presently employed by AeroPacific Consulting as the principal.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Plume effects on Aircraft Loads and Handling Analysis of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/16/2010 Signed: Douglas M. Moss

At: Boston, MA

DECLARATION OF
GARY NORMOYLE

I, Gary Normoyle, declare as follows:

1. I am presently employed by Diamond Generating Corporation as Director of Engineering.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Alternatives for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/16/10 Signed: _____

At: Los Angeles, CA

DECLARATION OF
GARY NORMOYLE

I, Gary Normoyle, declare as follows:

1. I am presently employed by Diamond Generating Corporation as Director of Engineering.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Project Description for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/16/10 Signed: _____

At: Los Angeles, CA

DECLARATION OF
GARY NORMOYLE

I, Gary Normoyle, declare as follows:

1. I am presently employed by Diamond Generating Corporation as Director of Engineering.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Introduction Section(s) of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/16/10 Signed: _____

At: Los Angeles, CA

DECLARATION OF
TOM PRIESTLEY

I, Tom Priestley, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Technologist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Socioeconomics for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 13, 2010 Signed: Thomas J. Priestley

At: Los Angeles, California

DECLARATION OF
TOM PRIESTLEY

I, Tom Priestley, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Technologist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. The attached testimony on Visual Resources for the Mariposa Energy Project was prepared under my direction based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 13, 2010 Signed: Thomas J. Priestley

At: Los Angeles, California

DECLARATION OF
JERRY SALAMY

I, Jerry Salamy, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Principal Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Air Quality for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/20/2010 Signed: _____

At: Sacramento, California

DECLARATION OF
JERRY SALAMY

I, Jerry Salamy, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Principal Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Hazardous Materials for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/20/2010 Signed: _____

At: Sacramento, California

DECLARATION OF
JERRY SALAMY

I, Jerry Salamy, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Principal Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Public Health for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/20/2010 Signed: _____

At: Sacramento, California

DECLARATION OF
JERRY SALAMY

I, Jerry Salamy, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Principal Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Pilot Exposure Analysis of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/20/2010 Signed: _____

At: Sacramento, California

DECLARATION OF
STEPHEN SHAW

I, Stephen Shaw, declare as follows:

1. I am presently employed by The Boeing Company as an aeronautical engineer. With respect to working for Senta Engineering on the Mariposa Energy Project Plume Effects on Local Aviation, I do not represent The Boeing Company.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I contributed to the preparation of the attached testimony (1. Mariposa Energy Project Plume Effects on Local Aviation, 28 July 2010; 2. Mariposa Energy Project Plume Effect on Local Aviation: Aircraft Loads and Handling, 15 June 2010; 3. Mariposa Energy Project Plume Effect on Local Aviation: Effects of Reduced Oxygen Levels, 9 June 2010) on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 13, 2010 Signed: _____

At: Everett, Washington

DECLARATION OF
HENRY SHIU

I, Henry Shiu, declare as follows:

1. I am presently employed by Senta Engineering, LLC as a Principal Consulting Engineer.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony (1. Mariposa Energy Project Plume Effects on Local Aviation, 28 July 2010; 2. Mariposa Energy Project Plume Effects on Local Aviation: Aircraft Loads and Handling, 15 June 2010; 3. Mariposa Energy Project Plume Effects on Local Aviation: Effects of Reduced Oxygen Levels, 9 June 2010) on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 15 December 2010 Signed: _____

At: Davis, CA

DECLARATION OF
ANDREW SOLBERG

I, Andrew Solberg, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as an Engineer.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Computational Fluid Dynamics Turbine Exhaust Velocity Characterization and the Katestone Environmental Assessment of Vertical Plume Velocities Analyses of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/17/10 Signed: _____

At: Reno, Nevada

DECLARATION OF
W. GEOFFREY SPAULDING, Ph.D.

I, W. Geoffrey Spaulding, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Technical Consultant.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Paleontological Resources for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

W. Geoffrey Spaulding

Dated: December 17, 2010 Signed: //e//

At: Las Vegas, Nevada

DECLARATION OF
DOUG URRY

I, Doug Urry, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Alternatives for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/15/10 Signed: _____

At: Sacramento, California

DECLARATION OF
DOUG URRY

I, Doug Urry, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Hazardous Materials for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/15/10 Signed: _____

At: Sacramento, California

DECLARATION OF
DOUG URRY

I, Doug Urry, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Project Description for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/15/10 Signed: _____

At: Sacramento, California

DECLARATION OF
DOUG URRY

I, Doug Urry, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Introduction and Summary Section(s) and the FAA Determination of No Hazard, and the Katestone Environmental Assessment of Vertical Plume Velocities Analyses of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/15/10 Signed: _____

At: Sacramento, California

DECLARATION OF
DOUG URRY

I, Doug Urry, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Waste Management for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/15/10 Signed: _____

At: Sacramento, California

DECLARATION OF
DOUG URRY

I, Doug Urry, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Worker Health and Safety for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/15/10 Signed: _____

At: Sacramento, California

DECLARATION OF

C.P. "CASE" VAN DAM, D. Engr.

I, C.P. "Case" van Dam, declare as follows:

1. I am presently employed by the University of California as a Professor of Mechanical and Aerospace Engineering.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony (1. Mariposa Energy Project Plume Effects on Local Aviation, 28 July 2010; 2. Mariposa Energy Project Plume Effects on Local Aviation: Aircraft Loads and Handling, 15 June 2010; 3. Mariposa Energy Project Plume Effects on Local Aviation: Effects of Reduced Oxygen Levels, 9 June 2010) on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 13 December 2010 Signed: _____

At: Davis, California

DECLARATION OF
RANDAL VAN ESS, PE

I, Randal Van Ess, declare as follows:

1. I am presently employed by POWER Engineers, Inc. as a Senior Project Engineer I.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Electrical Transmission for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 12/13/10 Signed: Randal Van Ess

At: San Diego, CA

DECLARATION OF
WESLEY DAVID WARDALL

I, Wesley David Wardall, declare as follows:

1. I am presently self employed as a consulting aircraft structures engineer, with an FAA Designated Engineering Representative authorization.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I contributed to the preparation of the attached testimony on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Plume effects on Aircraft Loads and Handling Analysis of this testimony and the exhibits which are referenced therein.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 15, 2010

Signed: Wesley D. Wardall

At: Ione, California

DECLARATION OF
BARRY YURTIS

I, Barry Yurtis, declare as follows:

1. I am presently employed by Williams Aviation Consultants, Inc. as Vice President of Domestic Operations.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I contributed to the preparation of the attached testimony on the Traffic and Transportation, Aviation for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge. I am sponsoring the Introduction, Summary Section(s) and the FAA Determination of No Hazard to Air Navigation and FAA Jurisdiction Analyses of this testimony and the exhibits which are referenced therein.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 16, 2010

Barry Yurtis

At: Gilbert, Arizona

DECLARATION OF
FATUMA YUSUF

I, Fatuma Yusuf, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Technologist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Socioeconomics for the Mariposa Energy Project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: December 14, 2010 Signed: _____

At: Sacramento, California