Inglewood Basketball & Entertainment Center Draft EIR: Review of Suggested Mitigation Measures

Prepared for City of Inglewood

May 2020

Ray Gorski
rgorski@pacbell.net
760 - 715 - 5391

1. INTRODUCTION

This report documents the results of an assessment of the recommended revisions to the Inglewood Basketball & Entertainment Center (IBEC) Draft EIR submitted by the South Coast Air Quality Management District (SCAQMD) and Natural Resources Defense Council (NRDC). The recommendations address increased utilization of near-zero and zero emission construction equipment in both on-road and off-road applications during construction, as well as the utilization of zero-emission vehicles once the IBEC is operational.

2. APPROACH & LIMITATIONS OF THE ASSESSMENT

The analysis is based in large part on the experience of the author in monitoring construction equipment air pollution mitigation compliance on large scale construction projects currently under development within the Los Angeles Region. Additionally, the author has consulted construction equipment vendors and rental companies regarding the availability of near-zero and zero-emission construction equipment currently available or planned for near-term deployment in the commercial marketplace. This includes an assessment of past and current state and local grant funding awards for the purchase of near-zero on-road construction equipment, including but not limited to material delivery and soil transport trucks. This was performed to understand the vocations near-zero and zero-emissions equipment is used in, as well as identify firms that utilize near-zero on-road trucks and off-road equipment.

Finally, an assessment was performed to determine whether or not it would be feasible to require exclusive use of near-zero and zero-emission delivery trucks and zero-emission event transportation shuttle vehicles during IBEC operations. To facilitate this analysis, a survey of the commercial availability of passenger shuttle vehicles that could potentially be used to IBEC was performed. This includes information on transportation providers that currently operate zero-emission shuttle, bus or motor coach services. The primary sources of information used in this element of the analysis include the following:

- Vehicle Manufacturer Technical Information & Specifications;
- California HVIP Zero-Emission Vehicle Database;
- Vehicle Manufacturer' Client Representations, including Press Releases, Testimonials, etc.;
- Public Transportation Agency & Private Transportation Provider Fleet Composition.

3. OVERALL FINDINGS

The findings of this independent assessment of the availability of near-zero and zero-emission construction equipment, trucks, and event transportation shuttles are as follows. Additional detail is included in subsequent Sections of this report:

a) With respect to the South Coast AQMD's recommended revisions to the air quality mitigation measures and design features for construction included in the EIR, the SCAQMD's recommendations as written would be infeasible to implement today, and likely infeasible – under normal business practices - to implement during construction. Near-zero and zero-emission vehicles and equipment of the type required for construction of the Proposed Project either do not exist, or are not sufficiently available, within construction companies or construction equipment rental companies within the greater Los Angeles region;

b) With respect to the utilization of near-zero and zero-emissions vehicles by vendors and material delivery trucks to support ongoing operations at the IBEC, it is infeasible to commit to the utilization of vehicles that today are in the early stages of commercialization and are not deployed in the vocations that typically support event center operations;

c) With respect to the utilization of zero-emissions event transportation shuttles to support patron access to the IBEC, it is infeasible to commit to the utilization of zero-emission shuttles on the first day of IBEC operation that today are in the early stages of commercialization and are not deployed by transportation providers that typically provide event center transportation services.

2. RESPONSE TO RECOMMENDED REVISIONS TO DEIR AIR QUALITY MITIGATION MEASURES & PROJECT DESIGN FEATURES

The SCAQMD comment letter dated March 10, 2020, recommends the IBEC EIR be modified as it pertains to the air quality project design features and mitigation measures. Specifically, the SCAQMD recommends the following:

- That, at a minimum, near-zero emission trucks be required for use during both project construction and IBEC operation;
- Require the use of zero-emission heavy duty trucks during both project construction and IBEC operation;

- Require the use of (more) electric construction equipment; including specifically excavators, wheel loaders, and soil compactors in the EIR listing of equipment that shall be electric or alternative fuel.

2.1 – Require Near-Zero Emission Trucks to Support IBEC Construction: With respect to the SCAQMD recommendation to only utilize near-zero emission trucks or cleaner to support IBEC construction, based on my analysis of the *current and foreseeable market conditions, a requirement dictating exclusive use of near-zero trucks would be infeasible.*

"Near-zero" heavy-duty engine technology is currently limited to alternative fuels, specifically natural gas and liquefied petroleum gas technologies. The South Coast AQMD comments cite three engine displacements (sizes) that are commercially available: 6.7 liter, 6.8 liter, and 8.9 liter displacements. To determine if these engines or other existing or anticipated near-zero or zero emission technologies would likely be available to support IBEC construction and operations, I conducted an investigation into the current construction vehicle inventory in the greater Los Angeles region.

A common feature across trucks and equipment equipped with near-zero engines is that the vast majority – if not all - received an incentive to lower the initial purchase price. The alternative fuel engines cited by the South Coast AQMD have a significant incremental cost above that of a conventional diesel engine. This incremental cost can be on the order of $45,000 or greater. Due to this higher cost, all of the fleets that have purchased or are in the process of purchasing trucks equipped with these near-zero engines have used incentives offered by the California Air Resources Board (CARB), California Energy Commission (CEC), and programs offered by or administered through the SCAQMD. Therefore, evaluating the incentives that have been paid for or are in process provides the best indicator of the availability and utilization of near-zero and zero emission trucks.

I conducted a review to determine where state and local incentives for near-zero engines have been allocated, including those that have been "paid" and those "in process". The objective is to understand the locations within California where the trucks are deployed, and importantly, the construction vocations the trucks are used in. The purpose is to determine if near-zero trucks are currently available within the greater Los Angeles area to support IBEC construction activities.

All major California incentive programs that offer a cost reduction for near-zero engines were evaluated based on public data available through CARB and the South Coast AQMD. The specific incentive programs reviewed include the following:

- Air Resources Board HVIP, administered by CALSTART;

- Air Resources Board Carl Moyer Program, administered by the SCAQMD;
- Mobile Source Air Pollution Reduction Review Committee, administered by the SCAQMD
- California Prop IB, administered by the SCAQMD;
- California Energy Commission Alternative Fuel Incentive Programs; and
- SCAQMD Voucher Incentive Program (an element of the Carl Moyer Program).

Approximately 887 South Coast AQMD incentives awarded towards the purchase of near-zero engines were reviewed, taking into account incentive programs initiated over the past three (3) years. This includes the Carl Moyer, Mobile Source Air Pollution Reduction Review Committee, Prop 1B, and Voucher Incentive Programs (VIP). In addition, grant programs administered by the California Energy Commission under their Alternative and Renewable Fuel and Vehicle Technology Program were reviewed over life of those programs.

With respect to the California Air Resources Board HVIP program, 2,134 records were reviewed over the life of the HVIP program. HVIP provides a buy-down incentive for near-zero engines at the point of sale.

The results of this investigation to determine the specific vocations trucks receiving incentives are used in are as follows.

- The majority of trucks equipped with near-zero engines that received an incentive California are used in the vocations of refuse collection, drayage trucking, and beverage delivery;
- Within the SCAQMD jurisdiction, construction-related equipment equipped with near-zero engines receiving an incentive include approximately 200 concrete mix trucks and approximately 20 dump trucks;
- Trucks used in other construction-related vocations, such as material delivery and haul trucks, were not identified as receiving a near-zero engine incentive.

The project applicant has previously committed to the use of alternative fuel concrete mix trucks. The lack of incentives applied to material delivery and haul trucks demonstrates that they are not currently available for this construction vocation.

Finding: No near-zero construction trucks were identified as being currently deployed for material delivery and hauling. Given current conditions, compliance with the SCAQMD recommendation to use near-zero trucks in construction-related activities, including but not limited to material delivery and haul trucks, would be infeasible.

2.2 – Require Zero Emission Trucks & Equipment to Support IBEC Construction: The SCAQMD also recommends that the list of electric or alternative fuel equipment included in EIR Section 3.2-1 be expanded to include excavators, wheel loaders, and soil compactors. The SCAQMD cites specific examples of this construction equipment that is commercially available in a zero-emissions configuration.

However, a review of the electric equipment examples included on Page 11 of the SCAQMD comment letter clearly illustrates that this is compact electric equipment with limited utility on a construction project of the scope of the IBEC. The electric equipment also has limited run times on the order of four to five hours, less than a typical construction shift duration.

Finding: It would be infeasible for the Draft EIR to require that all excavators, wheel loaders, and compactors be electric at this time. Compact, medium duty equipment does exist in the commercial marketplace; however, this equipment has limited capacity and capabilities when viewed in the context of a major construction project. Thus, it is reasonable to conclude that major construction activities for the project would necessitate the use of heavy-duty off-road construction equipment, including excavators, wheel loaders, and compactors, that operate on diesel fuel.

3. USE OF NEAR-ZERO AND ZERO-EMISSION VEHICLES IN IBEC OPERATIONS

Finding: It is unknown as to what specific vehicles will be fully commercialized by opening day, and unknown as to whether these zero-emission trucks will be incorporated into the fleets of vendors that will support IBEC operations. It is therefore infeasible to require the use of near-zero or zero emission trucks exclusively.

The South Coast AQMD comment letter recommends that the Lead Agency require the use of zero-emission or near-zero emission trucks to reduce operational NOx emissions. While providing incentives to use more near-zero and zero-emission trucks during operation is a reasonable approach that could result in reduced mobile emissions, a strict requirement in the EIR to use near-zero or zero-emission vehicles exclusively in support of future IBEC operations, would be premature and therefore not feasible.

In making this determination, the following investigation was conducted:

- Assess what near-zero and zero-emission trucks are available or planned to be available that are of the type typically used in event center operations, including but not limited to food and beverage delivery, parcel delivery, etc.;

- Determine the numbers of applicable near-zero and zero-emission trucks currently deployed in the greater Los Angeles region and the vocations those vehicles are used in, i.e., beverage delivery, parcel delivery, etc.;

3.1 – Current Availability of Near-Zero & Zero-Emission Trucks: A comprehensive survey of truck manufacturers was conducted to characterize the availability of zero-and near-zero emission trucks that would typically be used in operations and logistics support of a major event center. This includes food and beverage delivery trucks, parcel delivery trucks, and bulk delivery trucks with gross vehicle weight ratings (GVWR) between 14,000 pounds and up to greater than 33,000 pounds – this covers the entire spectrum of heavy-duty trucks.

Five (5) manufacturers were identified that offer commercial near-zero trucks. It is notable that near-zero natural gas engine technology is only commercially available in larger Class 7 and 8 semi-tractor class of delivery truck (GVWR > 26,000 pounds). Near-zero manufacturers that offer Class 7 and 8 semi-tractors include the following:

- Freightliner (https://freightliner.com/trucks/natural-gas/)
- Kenworth (https://www.kenworth.com)
- Mack (https://www.macktrucks.com)
- Peterbilt (https://www.peterbilt.com/)
- Volvo (https://www.volvotrucks.us/trucks/natural-gas/)

Each of the manufacturers listed above offer Class 7/8 semi-tractors equipped with either the Cummins Westport 8.9 liter L9N or 11.9 liter ISX12N. These engines are certified to the Air Resources Board's Optional Low NOx Standard of 0.02 g/bhp-hr.

With respect to zero-emission heavy-duty trucks, the following manufacturers offer commercial or pre-commercial products:

- BYD (https://en.byd.com/truck/) – BYD manufactures zero-emission trucks in multiple configurations for vehicle GVWR Classes 5 through 8. Battery electric trucks can be purchased from BYD through their Los Angeles headquarters.
- Freightliner (https://freightliner.com/e-mobility/) – Freightliner offers two models of battery electric truck – the first is a Class 8 semi-tractor based on their Cascadia model, and the second a medium heavy-duty box truck designated the eM2 106. Freightliner trucks can be purchased through Excel Truck Group with locations in Virginia, North Carolina, and South Carolina.

- Lightning Systems (https://lightningsystems.com) – Lightning Systems manufactures the 6500XD medium heavy-duty box truck. The company is based in Loveland, CO. Primary dealership is Midway Ford Truck Center in Kansas City, MO.
- Phoenix Motorcars (http://www.phoenixmotorcars.com/products/) – Phoenix Motorcars, headquartered in Ontario, California, manufactures the ZEUS 500 light heavy-duty truck platform. This vehicle is a smaller delivery truck with a GVWR of 14,500 pounds.
- SEA Electric (https://www.sea-electric.com) – SEA manufacturers a range of electric trucks in multiple GVWR classes. The vehicles are manufactured in Australia but available locally from A-Z Bus Sales in Colton, California.
- Volvo (https://www.volvotrucks.us/innovation/electromobility/) – Volvo is currently demonstrating pre-commercial Class 7 and 8 heavy-duty battery electric trucks under the sponsorship of the Air Resources Board and South Coast AQMD. When commercially available in 2021, they will be sold through TEC Equipment located in Fontana, California.

3.2 – Current Deployments of Near-Zero & Zero-Emission Trucks: To understand where and in what vocations near-zero and zero emission trucks were deployed, an approach similar to that described above in Section 2.1 was employed. This included analyzing databases provided by the Air Resources Board and South Coast AQMD to determine where incentives have been provided to buy-down the higher cost associated with near-zero and zero-emission trucks. This assessment researched truck sales starting with year 2009 until today, and thus included all fiscal years where near-zero and zero-emission technologies were commercially available.

The incremental cost of a near-zero truck is greater than $45,000; the incremental cost of a zero-emission trucks ranges from approximately $80,000 to $150,000 or greater. Incentive funding has been available to lower the acquisition cost since the introduction of the near-zero and zero-emission truck, and the amount offered typically is on the order of the actual incremental cost. Since no fleet operator is prohibited from taking advantage of available incentives, it is unlikely that near-zero or zero-emission trucks have been deployed that did not take advantage of the substantial discounts offered. Thus, the tracking of where incentives have been provided is a very good indicator of what trucks have been purchased, the vocation they are used in, and where they are deployed.

The results of this analysis are as follows:

3.2.1 - Near-Zero Truck Deployments: Over 1,487 near-zero truck incentive records were researched. Of this number, eight (8) were identified that correspond to food, beverage, and

restaurant delivery trucks. Approximately 131 are in the vocation of parcel delivery (UPS, etc.) The vast majority of the near-zero trucks operate in other vocations that are unrelated to goods delivery or operations support at a major event center. This is not to say that UPS may not deliver packages to the IBEC using a near-zero panel truck; it is, however, not feasible for one entity to dictate to a package delivery company what vehicle they use for delivery to that address. An additional 55 near-zero trucks were identified as being deployed in vocations that potentially support delivery companies; however, the data is not explicit.

The conclusion is that heavy-duty near-zero trucks are utilized in the greater Los Angeles region, but in vocations that are not directly tied, or directly controllable, by the IBEC.

3.2.2 – Zero-Emission Truck Deployments: A similar analysis was conducted to determine the vocations where electric trucks are currently being deployed. Records were researched back to fiscal year 2010. A total of 294 vehicles were identified. Of this number, eight beverage delivery trucks received incentives in fiscal years 2011 – 2012. It is unknown if these vehicles are still operational.

The databases are clear in identifying that the vast majority of the heavy-duty electric trucks being deployed are within large package delivery companies. The vehicles are predominately large vans or panel/step trucks – the vehicle type most commonly used by parcel delivery companies. There is no evidence that electric trucks are being adopted by companies other than package delivery in meaningful numbers at this time.

3.3 – Summary: While manufacturers have indicated their intentions to increase zero and near-zero vehicle product lines in response to perceived market demand, foreseeable regulatory agency rule making, and the promise of future incentive funding needed to make a business case, it would be infeasible to mandate in an EIR the future use of vehicles that today exist in very limited numbers and outside of the vocations that support operations of a major event center. It is unknown as to what vehicles will be fully commercialized by opening day, and unknown as to whether these zero-emission trucks will be incorporated into the fleets of vendors that will support IBEC operations. It is therefore infeasible to mandate the use of near-zero or zero emission trucks exclusively at the start of IBEC operations.

4. USE OF ZERO-EMISSION SHUTTLE VEHICLES TO PERFORM IBEC TRANSPORTATION SERVICES STARTING ON THE FIRST DAY OF IBEC OPERATIONS

Finding: Currently, zero-emission shuttle vehicles are not deployed in meaningful numbers within fleets that provide transportation services in the greater Los Angeles area. Thus, it is uncertain

as to whether zero-emission shuttle vehicles will be incorporated into the fleets of transportation service providers by IBEC opening day. Compliance with the recommendation to use zero-emission event transportation shuttles exclusively to support IBEC operations beginning on day one would be infeasible.

A comment was received from the NRDC advocating that the IBEC provide transportation services for patrons accessing events, and that the vehicles that perform this transportation service be required to be zero-emission shuttles. This recommendation raises several issues, specifically:

- The current and projected commercial availability of zero-emission passenger shuttles, buses, and motor coaches;
- The current and projected penetration of zero-emission vehicles in fleets that provide transportation services;
- The additional cost required to acquire zero emission vehicles; and
- The implications of constructing enabling heavy-duty electric vehicle charging and supporting infrastructure.

4.1 – Commercially Available Zero-Emission Passenger Shuttle Vehicles: The IBEC will utilize buses and coaches that accommodate approximately 45 passengers. This corresponds to a transit-style or motor coach vehicle typically on the order of 35 - 45 feet in length. The following manufacturers offer zero-emission transit-style buses and/or motor coaches in 30, 35, and/or 40-foot lengths:

- BYD USA (https://en.byd.com/bus/30-electric-transit-bus-2/) – BYD manufactures electric buses in 30, 35, 40, and 60-foot lengths at their Lancaster, California assembly plant. Buses can be purchased from BYD through their Los Angeles headquarters. BYD also offers electric motor coaches (non-transit style) in lengths up to 45 feet.
- Proterra (https://www.proterra.com/vehicles/catalyst-electric-bus/) offers 35 and 40-foot electric transit style buses. Proterra manufactures buses locally at their City of Industry, California facility.
- GreenPower Motor Company (https://www.greenpowerbus.com/product-line/) offers five (5) electric bus lengths in a range of 30 to 45-foot. The vehicles are manufactured in Porterville, California, and the local sales office is located in Rancho Cucamonga, California.
- Complete Coach Works (https://completecoach.com), located in Riverside, California, remanufactures existing diesel buses and converts them to a zero-emission electric drivetrain. All bus sizes and configurations are available.

- Gillig (https://www.gillig.com/battery-electric) is headquartered and manufactures electric buses in Livermore, California. Gillig is a traditional transit bus manufacturer.
- New Flyer (https://www.newflyer.com/buses/xcelsior-charge/) is an industry leading transit bus manufacturer. They offer both battery electric and hydrogen fuel cell buses in 35, 40, and 60-foot lengths.

4.2 – Zero-Emission Shuttle Vehicle Acquisition Costs & Available Incentives: The zero-emission shuttles and buses listed in Section 4.1, above, carry a price premium compared to traditional gasoline or diesel vehicles. To defray a portion of the incremental cost, that is, the additional acquisition cost associated with a zero-emission vehicle compared to a comparable, conventionally-fueled vehicle, the State and local regulatory agencies have previously offered purchase incentives. For example, the California Air Resources Board HVIP Program (https://www.californiahvip.org/how-to-participate/#Eligible-Vehicle-Catalog) offers incentive vouchers to lower the acquisition cost of zero-emission shuttle vehicles and buses. The incentive varies based on vehicle size; for fiscal year 2020, full size transit-style electric buses are eligible to receive a voucher on the order of $120,000 for 30 and 35-foot buses, and $150,000 for 40-foot zero-emission transit buses. Larger zero-emission motor coaches are eligible for up to $175,000.

4.3 - Current Deployments of Zero-Emission Shuttle Vehicles

An assessment was performed to determine where zero-emission shuttle and buses are deployed within the greater Los Angeles area. This was conducted using information publicly available from State databases as cited in the previous Sections. The assessment spans the timeframe of fiscal year 2015-'16 until the present.

A total of 289 zero-emission transit buses were identified as seeking an incentive during the period of 2015-'16 until now. Of this number, the data shows that zero (0) have actually received an incentive and are in the process of being deployed. Thus, at this time, a private transportation firm has not been identified within the greater Los Angeles area that owns and operates a full size electric bus or motor coach capable of accommodating 45 passengers.

4.4 - Heavy-Duty Electric Vehicle Charging & Supporting Infrastructure: An essential, enabling element of any zero-emission vehicle deployment is the availability of infrastructure to recharge heavy-duty vehicles. It is important to recognize that the type of electric vehicle supply equipment (EVSE) needed to recharge heavy-duty shuttles and buses is not the same as that to recharge an electric automobile. There is currently no publicly available EVSE to support heavy-

duty vehicles such as buses – these vehicles are recharged onsite where the vehicles are domiciled.

The installation of EVSE to support heavy-duty vehicles is a significant construction effort, especially if larger numbers of vehicles are to be recharged simultaneously. Such EVSE would need to be installed by transportation providers at their facilities, rather than at the Project Site, because the vehicles would only be used on a periodic basis at the Project Site, but on a full time basis by the transportation provider. The time required to design, permit, and construct heavy-duty EVSE is typically in excess of two (2) years and as long as four years. Coordination with the electric utility typically adds additional time to the overall construction schedule, as large scale EVSE infrastructure installations have an impact on the utility grid; thus, modifications to the electric service on the utility side of the meter must be taken into account.

There is also a significant cost associated with the acquisition and installation of EVSE. Programs such as Southern California Edison's Charge Ready Transport Program, available to help reduce the cost of implementing heavy-duty commercial EVSE within their territory, lower the EVSE construction costs. Additionally, Statewide programs such as low carbon fuel standard (LCFS) credit generation help lower the cost of electricity purchase.

4.4 – Feasibility of Requiring Zero-Emission Shuttle Transportation Services on Opening Day at the IBEC: The issue presented is whether or not it is reasonable to require zero-emission shuttle transportation services to support patron access to the IBEC when event operations commence. Based upon the above findings, this can be summarized as follows:

- Zero-emission buses that can accommodate the passenger capacity required by the IBEC are commercially available, but zero-emission buses or motor coaches are not currently operated by private transportation providers within the greater Los Angeles region;
- The essential EVSE infrastructure needed to recharge heavy-duty buses has a construction lead time on the order of two to four years. To accommodate the use of zero-emission buses at the time of IBEC opening, construction of this essential EVSE would need to begin immediately. There is nothing to suggest that private transportation providers are in the process of electrifying their facilities.

For the IBEC to be served by zero-emission transportation shuttles at the commencement of operations, a transportation provider would need to immediately make a commitment to position itself to provide this service. This would require a transportation provider to order appropriate zero-emission vehicles and finance those vehicles. It would also require the

transportation provider to initiate the planning to facilitate installation of necessary EVSE – a process that will take on the order of two to four years to complete.

Because zero emission fleets are in the early stages of commercialization, and require significant cost and time to implement necessary EVSE infrastructure, they are not currently deployed in the greater Los Angeles region by transportation providers that typically provide event center service. There is also no evidence that such providers are taking the necessary steps to acquire fleets and initiate the process to design and construct the necessary EVSE. Thus, it is not feasible to include a mitigation measure to require the IBEC project to use zero emission transportation shuttles at the start of operations.

Ray Gorski

2871 Jed Road

Escondido, CA 92027

760.715.5391

Education

University of Illinois, BS in Thermomechanical Engineering, 1982

Skills and Experience:

Ray Gorski is an engineer who has worked on transportation emissions reduction technologies and policy analysis for more than 27 years. He currently consults on air quality and transportation related issues to the South Coast Air Quality Management District (SCAQMD) and the Mobile Source Air Pollution Reduction Review Committee (MSRC), where he manages implementation of Clean Transportation Funding Incentive Program. In addition to his ongoing work with the South Coast AQMD, Ray's current clients include:

- The Port of Los Angeles
- The Port of Long Beach
- Los Angeles County Metropolitan Transportation Authority
- The County of Riverside
- Riverside County Transportation Commission (RCTC)
- The San Bernardino County Transportation Authority (SBCTA)
- Los Angeles World Airports (LAX)
- The Anaheim Transportation Network

Relevant Work Experience

Technical Consultant, (June 1995 – Present). Since 1995, Mr. Gorski has been a successful independent consultant, serving numerous government agencies and private companies in the areas of engineering analysis, independent technical evaluation, including independent validation and verification (IV&V), and program implementation and management. For the past 25 years, Mr. Gorski has and continues to serve as the Technical Advisor to the MSRC, an organization formed under Assembly Bill 2766 responsible for developing and implementing air pollution reduction strategies in Southern California. Mr. Gorski serves as the principal engineer and analyst for this Committee whose members are elected officials from Los Angeles, Orange, Riverside, and San Bernardino Counties. To date, Mr. Gorski has developed and implemented programs targeting mobile source emission reductions valued at over $480 million.

Ray Gorski Resume, Page 2

In addition to his role as Technical Advisor to the MSRC, Ray Gorski also serves in the following capacities:

- Transportation Programs Consultant to Los Angeles County Metro. Since 2009, Ray has provided technical analysis and support to Los Angeles County Metro. His responsibilities are broad in scope, ranging from the review and analysis of projects submitted under Metro's Call for Projects, annual development of the air quality section of the Energy and Sustainability Report, the preparation of proposal input analysis in support of Metro's applications under the Greenhouse Gas Reduction Fund, as well as performing analyses in support of Metro's short range and long range transportation plans.
- Air Quality & Transportation Consultant to San Bernardino County Transportation Authority (SBCTA). Ray supports SBCTA in the areas of air pollution analysis and transportation engineering. Ray has been supporting SBCTA since 1999. Currently, Ray is assisting SBCTA in conducting a demonstration of heavy-duty electric vehicles in partnership with BNSF Railway Daylight Transportation, BYD, and Calstart.
- Technical Consulting on behalf of the Ports of Los Angeles and Long Beach – Continuously since 2008, Ray has supported the Port of Long Beach and Port of Los Angeles/LA Harbor Department on behalf of their jointly implemented Technology Advancement Program. This includes the engineering assessment of emerging technologies and the design, implementation, and management of technology demonstration projects. In addition, Ray is a member of a team that each year conducts an inventory of air pollutant emissions generated at each port. Ray had assisted both Ports in the development of the Joint Ports' Zero-Emissions Roadmap and most recently supported development of the Port of Los Angeles' Zero Emission White Paper. Currently, Ray is providing project management, testing, and data collection and analysis for two large scale demonstrations of zero-emission battery electric cargo handling equipment and associated electric vehicle supply equipment, including the installation of DC fast charging EVSE at port marine terminals.
- Independent Third Party Monitor, Los Angeles World Airports – LAX. Mr. Gorski serves as the Independent Third Party Monitor for Master Plan construction projects at LAX. He has served in this capacity since 2006. In his role as Third Party Monitor, Ray ensures that airport construction operations conform to environmental requirements stipulated in a court---ordered settlement. In addition to oversight of major construction, Ray works with LAX in implementing their Alternative Fuel Vehicles Requirements Program, where he recently designed and implemented an incentive program for electric ground support

equipment (GSE).

- Anaheim Transportation Network – Ray is currently assisting the ATN in acquiring 42 electric buses, installing a micro-grid energy storage and management system, and designing a photovoltaic canopy at their new facility in Anaheim, CA.
- Air Quality & Transportation Consultant to the Riverside County Transportation Commission (RCTC). Ray provides independent engineering analysis, specializing in air quality mitigation assessments and transportation planning and construction in support of RCTC's Congestion Mitigation/Air Quality programs. Ray has supported RCTC as an independent contractor on a continuous basis since 1999. In addition to supporting RCTC directly, RCTC uses Ray to support projects and programs implemented by the Riverside Transit Agency (RTA), most recently to assist RTA in the TCM project substitution process within the SCAG Transportation Conformity Working Group. Additionally, Ray supports RCTC and RTA in the development of proposals submitted under the Greenhouse Gas Reduction Fund.

Prior to 1995, Ray was employed as Senior Staff Scientist at Science Applications International Corporation in Torrance, CA. In this capacity, he served as Program Manager on several aerospace programs in support of NASA and the US Department of Defense.