



2012-2013 WORK PLAN

UNIVERSITY OF CALIFORNIA TRANSPORTATION CENTER

**Type of UTC: Regional Center
Federal Region 9**

Lead Institution:

University of California, Berkeley

Core Members of Consortium:

University of California, Davis
University of California, Irvine
University of California, Los Angeles
University of California, Riverside
University of California, Santa Barbara

Affiliate Members of Consortium:

California State University at Pomona
California State University at Sacramento
California State University at San Bernardino
California State University at San Luis Obispo

A.1 KEY RESEARCH ACTIVITIES

Our consortium will focus on three themes identified by USDOT in its strategic plan—*environmental sustainability*, *economic competitiveness*, and *livability*—and, importantly, the connections between them. Advancing each of these objectives is important in and of itself; however, our UTC recognizes that the three are closely inter-twined and oftentimes co-dependent. Our UTC will thus give particular attention to the synergies that can be created and cross purposes that are served when working in a coordinated fashion on all three fronts.

The choice of these three themes reflects the breadth, depth, and wealth of knowledge and research capacities found across the six core members of our consortium. There is no better intellectual environment for conducting cutting-edge research and advancing basic and applied knowledge in these areas than across the campuses of the University of California. Our three themes are also highly relevant to the multitude of contemporary policy and technological challenges currently facing the transportation sectors of California and other southwestern states. We aim to be the “Go To” organization for federal modal administrations, California agencies, and policy-makers throughout Region 9 seeking well-informed advice, carefully designed research investigations, and rapid-response studies on these and related topics.

California is a particularly appropriate setting for focusing on the three strategic themes chosen by our consortium. Currently, California makes up 12 percent of the nation’s population and contributes to 13.3 percent of its GDP, exceeding the economic output of all of Italy. The state’s ecological footprint is also enormous. Only the US as a whole and China consume more oil than California. Presently, the typical Californian produces 11 tons of carbon dioxide per year, nearly half coming from the transport sector, making California the world’s 12th largest source of greenhouse gas (GHG) emissions. The state is also home to the six smoggiest air basins in the nation. California, however, is also internationally known as an incubator of innovation and progressive change. It has long been a national leader in enacting legislation that protects natural environments, promotes clean-fuel technologies, and shrinks the transportation sector’s carbon footprint. California’s Global Warming Solutions Act (Assembly Bill 32), passed in 2006, calls for reducing carbon dioxide emissions to 1990 levels by 2020. A companion bill, Senate Bill 375, specifically targets the integration of transportation and land-use systems as a tool for achieving AB 32 GHG-reduction targets. Under the bill, metropolitan areas throughout the state must introduce strategies that curb sprawl and promote less carbon-intensive built forms like transit-oriented development (TOD). Both the marketplace and public policies are responding. Today, California has more plug-in hybrids, CNG buses, miles of High-Occupancy Vehicle (HOV), Toll (HOT), and management lanes, and weekly vanpoolers than any state. What we do in California is of huge importance, not just to Californians, but also the nation and entire world.

As the gateway to the Pacific Rim, California is also a vital link in the movement of freight and goods throughout America. The ports of Los Angeles and Long Beach are the nation’s busiest. The state’s two largest airports, LAX and SFO, rank in the top 10 of total annual enplanements. Expediting the flow of freight and materials in and out of ports in ways that promote economic growth without harming natural and built environments or disadvantaged communities poses both logistical and public-policy challenges. Intra- and interstate commerce will only pick up if and when the planned High Speed Rail through the spine of the state gets built. Our consortium is up to the task of tackling the kinds of technological and public-policy challenges posed by large-scale infrastructure investments, now and in the future.

Below, we elaborate on the three strategic themes and the kind of attention and focus our consortium plans to give them.

a.1.1 *Environmental sustainability* is vital for creating clean, healthy, and functional cities and regions of the future. The transport of people and goods consumes nearly three-quarters of the nation’s petroleum,

emits around a third of greenhouse gases, and is responsible for around half of urban air pollution. Fossil fuel-based travel also negatively impacts air quality, water quality, and habitat quality, with serious implications for economic well-being, human health, natural ecologies, and the long-term environmental sustainability of the planet. Finding ways to shrink the sector's ecological footprint are national, state, and local priorities.

Our consortium is well-positioned to take on these challenges. As one of the world's preeminent loci for advanced research and education on environmental sustainability, UC campuses have provided critical knowledge and modeling tools that underpin an array of transport-related GHG-reduction policies and laws. In the case of low-carbon fuel standards, California's governor formally requested assistance from UC via an Executive Order to develop a policy to reduce the carbon intensity of transportation fuels. A team of UC Berkeley and UC Davis researchers carried out original scientific research and then designed a draft low-carbon fuel standard to meet a host of economic, social equity, legal, and administrative objectives. It was adopted in nearly identical form to what was recommended and is now being imitated by a large number of states and countries, including British Columbia, the northeastern and mid-Atlantic states, and the European Union. California's Air Resources Board (ARB) also requested UC to evaluate the design of a fee-bate program (whereby consumers pay a fee when buying a gas guzzler car and receive a rebate for an efficient car). That analysis, headed by ITS-Davis, is now under consideration by the State.

Technological advances, such as clean-fuel vehicles and intelligent transportation systems (ITS) that improve traffic flows, are part of the solution for creating sustainable futures. However, so are strategies that moderate the growth in vehicular travel without reducing the nation's continually growing demand for social and economic interaction. More policy-oriented strategies that complement technological ones include demand management techniques, such as improved pricing and management of parking, eco-driving, as well as land-use approaches, such as TOD, that promote alternative means of travel. UC researchers have been providing support to the California ARB and other agencies on synthesizing the evidence and developing tools for forecasting the effectiveness of such strategies.

The pitting of technological and more policy oriented strategies as an "either/or" proposition is, we believe, a false dichotomy. Advances are needed on both fronts. Electric vehicle (EV) technologies and smart growth communities, for example, are wholly compatible. Limited-range EVs/plug-in hybrids are particularly well-suited to compact, mixed-use communities that shorten travel distances. Modern technologies (e.g., global positioning systems and automatic vehicle location) enable real-time dynamic pricing tied to vehicle-miles traveled (VMT) and congestion levels and at the same time can strengthen the social, economic, and cultural vibrancy of core cities. Central London, Singapore, and Stockholm have not suffered from the introduction of higher peak-period tolls. Or take the case of smart-parking technologies. An estimated 25 percent of all traffic in some districts of San Francisco and Los Angeles is made up of motorists cruising for parking. Smart technologies (e.g., sensors in parking spaces that monitor occupancy) can reduce such cruising, inform motorists of the closest available space, and allow dynamic pricing of parking (i.e., higher fees in congested times; lower ones in slack periods). Such technologies not only shrink parking's enormous footprint, but also improve the quality of urban environments and in so doing encourage less carbon-intensive modes of travel, including walking and cycling.

a.1.2 Economic competitiveness has always been a core focus of transportation planning and engineering since efficient transportation systems and operations are vital toward sustained economic growth and prosperity. The nation's economy relies crucially on its systems of highways, ports, and mass transportation to swiftly and safely move raw materials, labor, manufactured products, component parts, and ideas to produce and exchange goods and services. Bottlenecks on highways leading to and from ports, unreliable mass transit systems, and deteriorating traffic conditions can strangle economic growth and,

if left unchecked, place America's cities and regions at a global economic disadvantage. In 2009, the congestion "invoice" for the extra time and fuel spent moving people and goods in America's 439 urban areas reached \$115 billion.¹ Policy-makers well understand this. The *Economist* Intelligence Unit Global Survey, released in September 2010, reported that 61 percent of mayors worldwide believed that "improving public transport and roads" is the most important way "to make their cities more competitive for businesses."² As home to the busiest port in the nation and four of America's 22 most congested urbanized areas, California has a vested economic stake in planning, designing, operating, managing, and pricing multi-modal transportation facilities and services in the most efficient, resourceful way possible.

The University of California has established itself as an intellectual leader in such areas as traffic operations, intelligent transportation systems (ITS), and transportation/land-use integration. Major advances in the field of traffic flow theory originated at UC Berkeley, which has over the years spawned the world's leading systems for traffic measurement through loop detectors (Caltrans Performance Measure System-PeMS) and video surveillance (developed at the Berkeley Highway Laboratory) as well as freeway traffic control through ramp-metering (Tools for Operational Planning-TOPL).

UC campuses also have an established track record at integrating travel-demand models in ways that inform and shape public policies. For example, UC Santa Barbara's GIS-based travel forecasting tools (SimAGENT) and UC Irvine's advanced traffic simulation models are being integrated to predict regional transportation flows, and in turn are being linked to UC Davis's urban land-use model PECAS (Production Exchange Consumption Allocation System) to estimate impacts on fuel consumption and GHG emissions. Another successful collaboration has been the integration of advanced traffic monitoring technologies (based on GPS-enabled cellular phones) developed by UC Berkeley researchers with vehicle emission measurement tools developed at UC Riverside (and certified by USEPA and the California Air Resources Board as the gold standard for on-road testing).

Economic competitiveness is not just about moving people and freight swiftly, safely, and cleanly. Desirable and therefore competitive places are also socially inclusive and diverse. Equity concerns have been especially prominent in the research of UC scholars. UCLA researchers have examined the equity of road and transit pricing in comparison with other finance techniques commonly used to pay for transportation infrastructure and services. Studies have also shown that efforts to curb automobile use may help to clean the environment, but for many segments of society can lead to social exclusion and negative economic outcomes. Scholars from UCLA and UC Berkeley have published among the most widely cited work to date on topics like impacts of transportation programs on welfare-to-work, spatial mismatches and employment outcomes, and equity consequences of alternative road, parking, and transit pricing schemes.

a.1.3 Livability continues to gain importance as a national, state, and local goal because it is intimately related to social well-being, peoples' attachment to community and place, and healthy living. Livable communities feature well-designed streetscapes, attractive civic spaces, the inter-mixing of land uses, "complete streets" that promote walking and cycling, and Safe Routes to School. Such environments are increasingly in high demand. We know this not only from public opinion polls but also real-estate markets. High-quality urban and suburban districts and well-designed places often command sizeable rent and land-value premiums. Importantly, the livability movement elevates accessibility, i.e., the ability of people to reach the places they wish to go, as an overarching goal in transportation planning and investment. Expediting traffic flows is certainly critical to creating accessible cities and regions, but so are urban designs that bring trip origins and destinations closer and information-technological advances that allow social and economic interactions without necessarily physical movements.

Scholars from several UC campuses, notably Santa Barbara, Irvine, Berkeley, and Davis, have developed

state-of-the-art transportation land use models and other planning tools that gauge impacts of livability-sustainability scenarios on accessibility, community well-being, and social equity. The SimAGENT model, an activity-based forecasting model, was developed by scholars from UC Santa Barbara with the help of UCTC funding, and is being used to test GHG-reduction scenarios by the Southern California Association of Governments (SCAG) in response to California's SB 375. Urban design work by scholars on the Berkeley and Los Angeles campuses has led to streetscape designs and multi-dimensional evaluation tools that enhance pedestrian and bicyclist comfort, safety, and connectivity. Over the years, seminal work on multi-way boulevards, complete and livable street designs, and freeway-to-boulevard/freeway-to-greenway conversions has come from UCTC-funded research. The effects of more efficient pricing on the quality of urban districts have also been studied. Widely cited research by UCLA scholars showed that parking policy reforms can have a strong positive effect on community betterment and local economic development, and are often the lynchpin to successful redevelopment investments. Researchers at UC Berkeley, UC Davis, and UC Irvine are international leaders in the study of the effect of community design and urban land-use patterns on travel behavior. Seminal and highly influential research on the travel-demand, environmental, and community development impacts of TOD, jobs-housing balance, neo-traditional community designs, urban containment policies, and other growth-management strategies has been carried out by scholars of our consortium.

a.1.4 Synergies exist and are waiting to be tapped into across the spheres of environmental sustainability, economic competitiveness, and livability. Our consortium will conduct the kinds of rigorous, grounded research that advances knowledge and trains future generations of transportation professionals not only within these domains but across them as well. Creating clean, livable cities, towns, and regions, for example, can be an effective economic development strategy—attractive and healthy living and working environments can attract and help retain high-skilled, high value-added firms, and workers of service-based economies. Cities and regions whose economies rely heavily on creative, knowledge-intensive industries, studies show, must design and build attractive cityscapes that promote active forms of mobility (e.g., walking and bicycling) and improve environmental conditions such as air quality if they are to successfully compete in the 21st century global marketplace.³ Similarly, relieving traffic congestion not only makes cities and regions more economically competitive but also enhances livability. Public opinion polls routinely show that worsening traffic congestion is the number-one reason cited for the perceived declining quality of urban living in the eyes of the American public. Well-designed cities and efficient pricing of infrastructure that helps slow the growth in VMT can also promote economic growth. The recent report on *Growing Wealthier*, for example, founded that states with lower VMT per capita tend to have higher GDP per capita.⁴ While correlations do not prove causality, and other researchers have reached opposite conclusions,⁵ most would agree that the aim should be less about encouraging physical movement and more about designing communities and pricing resources to maximize economic and social interactions.

The linkages between *environmental sustainability* and *economic competitiveness*, we believe, are especially important. Besides attracting high-skilled firms and creative classes of workers, global cities with clean air, generous amounts of public spaces, attractive urban designs, and functional transportation and infrastructure systems are excellent incubators for growing the green economy. Advances in the production and distribution of clean-fuel vehicles that operate on renewable energy sources can stimulate private investment and create new employment and vocational opportunities.

a.1.5 Research Topics for DOT Strategic Goals

Appendix A of the *UTC Program 2011 Grant Solicitation* lists specific research topics identified by US-DOT modal administrations as areas of interest. Our consortium is well-positioned to conduct top-flight research on many of the topics within the themes of environmental sustainability, economic competitiveness, and livability, including the following.

ENVIRONMENTAL SUSTAINABILITY

• **Alternative fuels/energy and other sustainable technology solutions** (page 26 in Appendix A of Solicitation). The NextSTEPS multidisciplinary research program at UC Davis has focused on technological, investment, and policy pathways for transitioning to sustainable transportation energy futures. The challenges posed in propelling vehicles by electricity, bio-fuels, hydrogen, or more sustainable fossil fuels differ by regions and environmental settings. One important topic in this area is to examine the dynamics of change in the transport sector, focusing on consumer and organizational behavior as well as key driving factors and constraints faced by energy suppliers, vehicle manufacturers, and policymakers. This can help with the development of robust models pertaining to performance, economics, lifecycle analysis, sustainability, integrated assessment, optimization of energy systems, and technology assessment. From these models, UC scholars will be able to build realistic, transparent scenarios and transition strategies to illuminate what is needed to achieve society's goals for climate change, mobility, and energy security at acceptable costs and to inform industry planning and government policy. The NextSTEPS research consortium is funded by most of the major car and oil companies in the world, as well as US DOT, EPA, and DOE, reflecting the commitment to engagement with government and industry, and to producing products that are valued and used by others. This program and others, including the UC Davis Plug-in Hybrid and Electric Vehicle research center, founded by the State of California, also evaluate behaviors and policies that reduce oil use and GHG emissions and meet other sustainability goals, including broad market instruments such as carbon taxes, cap and trade, and fee-bates, as well as performance-based instruments such as a low-carbon fuel standard and vehicle standards. Work by UC Irvine economists, in conjunction with UC Davis's Business School, is furthering our knowledge of fuel economy standards by using standard household surveys to decipher household attributes associated with hybrid vehicle purchases. Our consortium is prepared to extend all this work to the entire US vehicle and fuels market. Advances in alternative, low-carbon fuels are also being led by UC Riverside's Sustainable Energy research group, focused on cellulosic ethanol and synthetic diesel fuels.

• **Applicability of linking agent-based microscale simulations of traffic data to fuel consumption/emissions models to produce better estimates of fuel consumption and emissions impacts of various transportation strategies and technologies** (page 26 in Appendix A of Solicitation). The marriage of sophisticated multi-layered models developed by two core partners of our consortium—UC Santa Barbara's SimAGENT travel forecasting model and UC Riverside's Comprehensive Modal Emissions Modeling (CMEM) suite—would provide a next-generation platform for translating scenario-driven transportation futures and operational strategies like ITS into simulated second-by-second estimates of fuel consumption and air emissions. Agent-based traffic simulation models developed and applied by transportation engineering faculty from UC Irvine, Berkeley, and Riverside could provide even more micro-scopic (e.g., intersection and corridor level) insights into how intelligent transportation and telematic systems as well as road-based cyber-physical systems impact the consumption and emission levels of alternative fuels.

ECONOMIC COMPETITIVENESS

• **New technologies and/or operating procedures that reduce air emissions and noise from freight movements and improve services to small and medium-sized cities and towns** (page 24 in Appendix A of Solicitation). Past and current research at UC Irvine in collaboration with UC Riverside has developed new modeling approaches to evaluate the health and environmental justice impacts of rail and heavy-duty diesel truck (HDDT) freight corridor operations and pollution mitigation strategies for the San Pedro Bay Ports (SPBP) of Long Beach and Los Angeles. Air-quality impacts (PM and NO_x) of drayage truck opera-

tions are being modeled not only on freeways but also on arterial roads adjacent to the SPBP, thus completing a missing link in modeling and evaluations. UC researchers are also now embarking on a state-of-the-art multimodal statewide freight forecasting model for California. Our consortium proposes a key enhancement to this model in coming years with important national implications: the modeling and evaluation of freight carbon pricing policies. Such policies will be critical toward achieving California's GHG-reduction mandates set by AB 32. In this extended work, we would quantify the value of carbon in California, and its elasticity with respect to the value of freight. We are also prepared to examine alternative pricing strategies specific to particular elements of the freight flow process (transshipment facilities, border crossings, truck infrastructure, land use, and geographical thresholds). Such an enhanced freight model (which captures input-output relationships and transshipment constraints for variable total freight demand) can help identify which type of carbon freight pricing strategy is most cost-effective.

• **Effects of financial policies and practices on overall efficiency and competitiveness of the transportation system and potential modal integration** (page 24 in Appendix A of Solicitation). UCLA scholars have extensively studied parking as a key link between transportation and land use, with important consequences for cities, the economy, and the environment. UCTC-funded research on the cost of free parking, much of it summarized in the highly influential book, *The High Cost of Free Parking*,⁶ by Donald Shoup of UCLA, has prompted a growing number of US cities to charge fair-market prices for curb parking, dedicate the resulting revenue to finance public services in the metered districts, and reduce or remove off-street parking requirements. UCTC-funded research by UCLA scholars on employer-paid parking led to passage of California's parking cash-out law, and to changes in the Internal Revenue Code to encourage parking cash out. Building on past work, scholars from our consortium want to explore how modern communications and vehicle-location technologies can allow more dynamic and cost-sensitive pricing schemes to be introduced for parking as well as driving cars, and the impacts on revenue in-take and environmental quality. Past work by UCLA scholars demonstrating that efficient parking pricing stimulated small-business expansions and community re-investments, we believe, can apply to other realms as well, such as the pricing of dynamic ridesharing, congested travel corridors, and door-to-door paratransit systems.

LIVABILITY

• **Development of community-based data visualization tools to support transportation decision makers to enhance livability and sustainability** (page 25 in Appendix A of Solicitation). The UrbanSim land use model system, developed by UC Berkeley's Paul Waddell, is being integrated with activity-based travel demand models and dynamic traffic assignment to better represent behavioral responses to land use and transportation policies at the parcel level of detail in order to evaluate walking-scale accessibility. New research on the livability of communities, including detailed accessibility and urban design indicators, would enable the enrichment of models and planning analyses to better address non-motorized and transit modes, and their interaction with other facets of community livability, including schools and employment access. Further development of the system could facilitate community engagement in not only visualizing alternative livability scenarios, but also engage residents in generating alternative community land use and transportation plans and evaluating their effectiveness, thus providing a new methodology to facilitate engagement and consensus building in achieving greater community livability outcomes. The recently launched Immersive Cities Lab, located in the College of Environmental Design at UC Berkeley, provides a world-class platform for translating data on changes to built environments (e.g., the introduction of mixed-use, complete street designs) into estimates of shifts in travel choices (e.g., shifts to active modes like walking and bicycling) and in turn fully immersed visual imagery from multiple perspectives, i.e., from pedestrian streetscapes to bird's-eye panoramas of an urban district (see accompanying box).

• **Congestion management for livability using real-time transportation information** (page 24 in Appendix A of Solicitation). UC Riverside scholars, through the Center for Environmental Research and Technology (CERT), have over the years spearheaded research on using real-time roadway and traffic information to: inform motorists of downstream traffic conditions (e.g., Dynamic Roadway Network, or DynaNET, for all of California); help drivers find the most eco-friendly route for minimizing fuel consumption, tailpipe emissions, and community impacts, (e.g., ECO-Routing, see box); provide drivers with real-time, dynamic advice on driving speeds, optimal acceleration and deceleration profiles, etc. to save fuel and reduce carbon emissions (e.g., Dynamic Eco-Driving); and capture data to inform ITS applications (e.g., Mobile Energy Emissions Telematics Systems, or MEETS, allowing energy and emissions to be calculated on a second-by-second basis for any type of vehicle). Our consortium is interested in investigating how such technologies can better segregate motorized vehicles from non-motorized (e.g., pedestrian and bicycle) flows to not only improve network performance and safety, but also enhance urban environments and the walking/bicycling experience.

• **Transit-Oriented Development (TOD) and consideration of social equity, mobility, and accessibility issues** (page 24 in Appendix A of Solicitation). Scholars from the Berkeley, Los Angeles, Davis, and Irvine campuses have a long-standing track record of examining impacts of TOD on travel choices, environmental conditions, access to employment, housing affordability, and community well-being, broadly defined. We are particularly interested in the connections between TOD and community development, including housing affordability (and therefore social equity). Transportation and housing are classic “bundled goods.” Our research shows that many TOD households self-select into station-area residences and act upon lifestyle preferences by reducing car ownership levels and thus the demand for off-street parking, thereby freeing up income for housing consumption. When supplemented by schemes like carsharing, our work suggests, TOD households not only lower costs associated with owning and using automobiles, but also make more informed and judicious travel choices, helping to reduce “wasted VMT.” We are interested in extending this work to examine how economizing on travel choices in turn promotes housing affordability and community development, particularly in mixed land-use settings, through increased household expenditures on local goods and services. Drawing empirical data from the Center for Transit Oriented Development (CTOD), housing census records, and local/regional sales and employment statistics will allow the associations between transit-oriented living, housing affordability, and local economic development to be carefully evaluated and, as a result, appropriate public-policy responses to be carefully crafted. We envisage the initiation and evaluation of pilot-demonstration programs that link programs like TOD, flexible parking policies, affordable housing, local business investments, and carsharing through the work of our consortium.

A.2 RESEARCH CAPABILITY: CAPACITIES AND PRIOR EXPERIENCE

UCTC has served as the Region 9 UTC for 23 years, since the inception of the UTC program. Over this period, faculty affiliates of UCTC have published more than 2,000 journal articles, 30 books, and 1,000 UCTC research reports and manuscripts. Eighty Ph.D. dissertations in transportation have been funded by UCTC grants, and far more were supported through graduate research appointments on faculty-led projects. Over the years, UCTC researchers and scholars have advanced knowledge and shaped practice in a number of important areas, including: traffic flow theory, measurement, and control; TOD; parking cash-out; lifecycle costing of infrastructure investments; pavement management; GIS and agent-based travel-demand modeling and forecasting (e.g., PECAS, UrbanSims, SimAGENT); transportation pricing policies; intelligent transportation systems; environmental justice within freight and passenger transport sec-

³ R. Cervero, 2009, Transport Infrastructure and Global Competitiveness: Balancing Mobility and Livability, *The Annals of the American Academy of Political and Social Science*, Vol. 626, pp. 210-225.

⁴ Center for Clean Air Policy, 2011, *Growing Wealthier: Smart Growth, Climate Change and Prosperity*, Washington, D.C.

⁵ QuantEcon, Inc., 2009, *Driving the Economy: Automotive Travel, Economic Growth, and the Risks of Global Warming Regulations*, Cascade Policy Institute, Portland, Oregon.

tors; health impacts of active transportation; energy and environmental impacts of eco-friendly driving and routing; effects of built environments and telecommunications on travel; transit cost modeling; and mobile-source air-quality monitoring and measurement. The findings of this vast body of research have appeared in top scholarly journals and been presented before the US Congress, numerous federal, state, and local agencies, and at international conferences of transportation professional organizations and learned societies. To make sure UCTC research findings reach a wide audience, over 230 articles have appeared in 38 issues of UCTC’s flagship, widely respected, and eminently readable publication, *Access* magazine.

The impact of research funded by UCTC is reflected by the high academic standing of its member institutions. Based on H-factor ranking of faculty research citations in transportation, three of the top 10 universities in transportation research worldwide are University of California members of our consortium (see Table 1).

TABLE 1: RANKING OF TOP 10 TRANSPORTATION PROGRAMS BY H-INDEX⁷

US Rank	Worldwide Rank	Program	h-index
1	1	UC Berkeley	38
2	2	MIT	37
	3	University of Montreal	36
3	4	University of Texas, Austin	34
4	5	UC Davis	32
	6	Hong Kong Univ. of Science and Technology	31
5	7	UC Irvine	31
6	8	Northwestern University	28
7	9	University of Washington	28
8	10	University of Minnesota	28

Note: Analysis conducted by the Institute of Transportation Studies, University of California, Irvine, in July, 2011 using ISI Web of Knowledge. Analysis based on 2010 Impact Factors of 26 journals in the JCR Science (*Transportation Science and Technology*) and 23 journals in the JCR Social Sciences (*Transportation*).

We are not content to just write about our research. We also want our ideas and findings implemented. UC researchers have made great strides in taking research products to the commercialization phase, such as through the California Center for Innovative Transportation (CCIT) at UC Berkeley. We have also built successful university-public-private partnerships, such as Mobile Millennium, which joins UC Berkeley faculty with Nokia, Caltrans, and USDOT; and the ZEV-NET program managed by the National Fuel Cell Research Center at UC Irvine.

a.2.1 Research Experience in Thematic Areas

Across our consortium’s three thematic areas of focus, UC researchers have provided intellectual leadership in a number of areas:

- **Environmental Sustainability:** Seminal, ground-breaking work has been carried out by UC scholars on: Strategies and modeling tools to reduce global (GHG) and local (photo-chemical smog; particulates) air pollution (Sperling, Niemeier, Handy, Ogden, Yeh, and Delucchi of UCD; Ritchie, Saphores, Brownstone, and Recker of UCI; Deakin, Harley, and Waddell of UCB; Barth,

⁶ D. Shoup, 2005, *The High Cost of Free Parking*, Chicago, Planner’s Press.

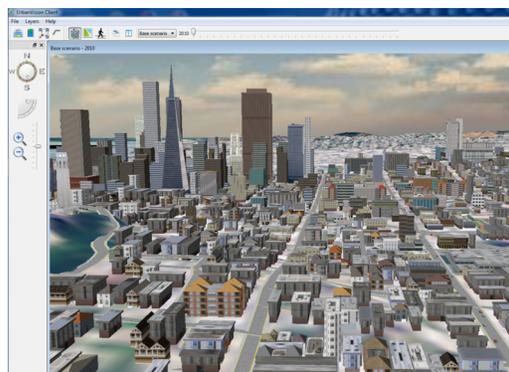
Cocker, and Boriboonsomsin of UCR);

- Designs and evaluations of alternative fuels and vehicles (Sperling, Niemeier, Burke, Ogden, and Kurani of UCD; Lipman, Shaheen, and Kammen of UCB; Norbeck, Park, Wyman, and Kumar of UCR);
- Measuring and predicting air quality, energy, and other environmental impacts of transportation systems (Sperling, Niemeier, Ogden, Delucchi, Yeh, and Handy of UCD; Saphores, Jin, and Jayakrishnan of UCI; Deakin and Harley of UCB; Barth and Boriboonsomsin of UCR);
- Pricing and finance approaches to reducing emissions, including carbon pricing, feebates, and cap-and-trade systems (Sperling, Bunch, Lin, and Mokhtarian of UCD; Breuckner, Brownstone, Saphores, and Small of UCI; Taylor, Crane, Shoup, Wang, and Wachs of UCLA); and
- Environmental sustainability in the transport sector and public policy (Sperling, Wheeler, Handy, Mokhtarian, Turrentine, Yeh, and Ogden of UCD; Deakin, Chapman, Waddell, and Cervero of UCB; Ritchie, Brownstone, DiMento, Saphores, and Boarnet of UCI; Taylor, Crane, Wang, and Wachs of UCLA).

Economic Competitiveness: UC scholars have advanced critical knowledge in many areas that influence

THE IMMERSIVE CITIES LAB

The Immersive Cities Lab at UC Berkeley features state-of-the-art urban simulation and 3D visualization capabilities designed by Paul Waddell in the Department of City and Regional Planning, and developed as open source software with collaborators in Electrical Engineering and Computer Science, Civil and Environmental Engineering, and partners at Purdue University, the University of Washington, and elsewhere. The Lab combines the best design, engineering and computation, in order to generate breakthroughs in the capacity to design, visualize, and analyze urban systems and their sustainability at scales ranging from the building to the metropolis. A large multi-touch wall display, powered by a custom-developed open source platform integrating 3D interactive visualization and simulation of urban landscapes, provides a truly immersive capability to engage researchers, students, and community stakeholders. The Lab enables diverse stakeholders within communities to explore the implications of alternative design and policy choices, and their consequences for their communities and the broader region.



Currently, the UrbanVision system developed by the Lab is being used to engage local governments and citizens from the San Francisco Bay Area in assessing alternative strategies to meet GHG-reduction targets by coordinating land use and transportation investments to reduce auto dependency, and accommodating anticipated population growth with affordable housing. The Lab will be available to researchers throughout the UC system and partners from other UTCs to explore ways of making cities, towns, and other places more livable, sustainable, and viable.

the economic productivity and competitiveness of the nation, states, cities, and regions, including:

- Behavioral and integrated transportation-land use demand modeling (Waddell, Walker, Chatman, Cervero, Deakin, McFadden, and Train from UCB; Mokhtarian, Niemeier, McCoy, Handy, and Salon from UCD; Brownstone, Golob, Recker, and Boarnet of UCI; Arnott from UCR; Goulias, Clark, and Goodchild from UCSB);
- Lifecycle costing and modeling of transportation investments and services (Horvath and Madanat from UCB; Delucchi, Kendall, Ogden, Yeh, and Harvey from UCD; Breuckner, Brownstone, Small from UCI; Arnott from UCR);
- Traffic logistics and flow (Daganzo, Cassidy, and Madanat from UCB; McNally, Jayakrishnan, Saphores, Ritchie, Regan, and Jin from UCI; Zhang and Fan from UC Davis);
- Traffic and vehicle management and control systems (Varaiya, Skabardonis, Sengupta, and Horowitz from UCB; Jayakrishnan, McNally, Regan, Ritchie, and Jin from UCI; Farrell and Barth from UCR; Zhang from UCD);
- Freight logistics and supply-chain management (Daganzo, Leachman, Kaminisky, and Shen from

ECO-ROUTING

Environment-Friendly Navigation

Developed by CE-CERT

From: los angeles international airport
To: alhambra

No. of Passenger(s): One

Options:
 Prefer Highways
 Normal
 Avoid Tolls

Minimize: CO2

Clear All Routes KML: (Evo) (Loop)

Developed by CE-CERT, UC Riverside (<http://www.cert.ucr.edu>)

D Time Queried (GMT): 2011-10-19 22:13:21
 I Time Completed (GMT): 2011-10-19 22:13:25

Minimize: CO2
 C Distance: 27.6 miles
 I Time: 34 minutes

Energy / Emissions:
 Fuel: 3363 g = 1,206 gal.
 CO: 61 g
 CO2: 10484 g
 HC: 266 g
 NOx: 8.32 g

Route KML: [KML]

Using this web-based application developed at UC Riverside to reroute traffic can not only lower fuel consumption and tailpipe emissions, but also reduce traffic impacts on neighborhoods, improve walking conditions, and contribute to the historic and socio-cultural preservation of communities.

UCB; Ritchie, Jayakrishnan, Regan, and Jin from UCI; Fan from UCD);

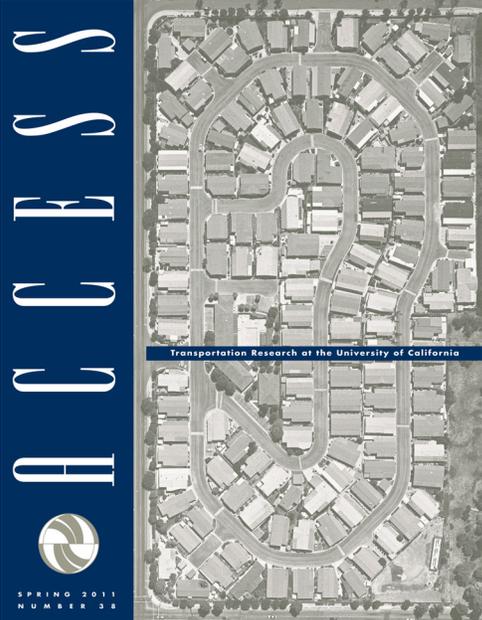
- Transit systems operations and design (Madanat, Cassidy, Kanafani, Daganzo, and Cervero from UCB; Taylor, Wachs, and Yoh from UCLA; Church from UCSB); and

- Transportation systems pricing and alternative financing approaches (Small, Breuckner, Recker, Saphores, and Boarnet from UCI; Shoup, Taylor, and Wachs from UCLA; Quigley, Chatman, Cervero, and Deakin from UCB).

Livability: UC scholars have conducted seminal and highly influential work on:

- Livable and complete streets (McDonald, Appleyard, Bosselmann, Southworth, and Jacobs from UCB; Loukaitou-Sideris from UCLA);
- Transit-oriented development and smart-growth initiatives (Cervero, Deakin, Chapman, and Frick from UCB; Boarnet and Houston from UCI; Crane, Loukaitou-Sideris, Taylor, Shoup, and Yoh from UCLA);
- Influences of built environments (at multiple scales) on travel behavior (Handy and Mokhtarian from UCD; Cervero, Deakin, Chatman, Waddell, and Walker from UCB; Boarnet, Brownstone, and McNally from UCI; Crane, Taylor, Blumenberg, and Wachs from UCLA);
- Visual simulations and modeling of transportation and land-use relationships (Waddell, Bosselmann, McDonald, and Cervero from UCB; Goulias from UCSB; McCoy and Rodier from UCD);
- Sense of place, location choice, and travel behavior (Goulias from UCSB; Waddell and McDonald from UCB; Mokhtarian from UCD); and
- Social equity of transportation programs (Blumenberg, Ong, Taylor, Crane, Stoll, Valenzuela, Yoh, and Wachs from UCLA; Cervero, Chatman, Deakin and Raphael of UCB; Day, Houston, Torres, and Dimento from UCI).

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- B. Harsman and J. Quigley, *Political and Public Acceptability of Congestion Pricing: Ideological and Self-Interest in Sweden*;
- M. Wachs, *Transportation, Jobs, and Economic Growth*;
- L. Davis and M. Kahn, *Cash for Clunkers? The Environmental Impact of Mexico's Demand for Used Vehicles*;
- E. Martin and S. Shaheen, *The Impact of Car-sharing on Household Vehicle Ownership*;
- D. Shoup, *Free Parking or Free Markets*;
- E. Morris, *Life in the Fast Lane*.

The vital role played by our students in advancing knowledge and practice cannot be overlooked. UC faculty research is supported by a large, diverse, bright and energetic group of graduate and undergraduate students across many fields who are passionate about making a positive impact on the environment, communities, regions, countries and the world through their research and practice. Many have gone on to become industry leaders, spanning the private sector, national, state, and local governments, and the academy.

a.2.2 Research Capacities of UC Campuses

Our consortium is supported by a deep and robust network of centers, institutes, and programs devoted to advancing transportation knowledge and practice across the UC campuses. This section briefly summarizes these resources and facilities.

- **UC Berkeley.** Transportation research by Berkeley's faculty and students is organized under the umbrella of the Institute of Transportation Studies, one of the largest, longest-standing, and most renowned university-based transportation research facilities in the world. Under this umbrella reside seven specialized research centers: PATH (Program for Advanced Transit and Highways), whose research focuses on improving surface transportation (both traffic and transit) operations through the application of advanced technology; TSRC (Transportation Sustainability Research Center), whose research seeks to improve sustainability by reducing the carbon footprint of transportation; the Berkeley Volvo Center of Excellence for Urban Transport, whose research aims to improve urban transportation by marrying policy and technology; SafeTREC, whose research focuses on improving traffic safety through planning and evaluating more effective safety measures; NEXTOR, an FAA Center of Excellence for Aviation Operations Research; and the Pavement Research Center. The Institute has long been the home of the Region 9 UTC (the University of California Transportation Center, or UCTC), and will continue as its home if this proposal is successful. Other institutes on the Berkeley campus which sponsor transportation-related research and technology transfer activities include the Institute of Urban and Regional Development (IURD), the Global Metropolitan Studies (GMS) program, the Center for Community Innovation (CCI), the Center for Environmental Public Policy (CEPP), the Fischer Center for Real Estate and Urban Economics, and the Energy Resources Research Group (ERG).

- **UC Davis.** The Institute of Transportation Studies at UC Davis serves as an umbrella for transportation research on the campus. Established in 1991, ITS-Davis is a multi-faceted, internationally acclaimed organization with more than 60 affiliated faculty and researchers representing 12 different academic departments and over 130 graduate students across 10 different programs. ITS-Davis has gained international recognition for building strong partnerships with industry, government, and the environmental community, integrating interdisciplinary research and education programs, and connecting research with public outreach and education. ITS-Davis has also been the administrative home of the Sustainable Transportation Center (STC), a Tier II UTC, which under the new multi-campus consortium will merge with UCTC, the Region 9 UTC for the past 23 years. Other successful centers housed at ITS-Davis include: Sustainable Transportation Energy Pathways (STEPS) Research Program; the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center, which serves as the hub of collaboration and research on plug-in hybrid and electric vehicles for the State of California; and the China Center for Energy and Transportation (C-CET), a two-way learning and research center with the mission of sharing experiences and ideas between California and China. Several other UC Davis research centers affiliated with ITS-Davis conduct research on transportation, including: Urban Land Use and Transportation Center (ULTRANS), which focuses on the relationships between land

⁷ Hirsch, J.E. 2005. An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences USA*, 102(46): 16569–16572.

use, transportation infrastructure, and government policy; UC Pavement Research Center (PRC); Road Ecology Center, which focuses on the impact of roads on natural landscapes and human communities; and the Air Quality Research Center (AQRC).

- **UC Irvine.** The UC Irvine Institute of Transportation Studies (ITS) serves as the focal point of UC Irvine's internationally renowned and multidisciplinary transportation education and research program. ITS-Irvine research involves faculty and students from The Henry Samueli School of Engineering, the School of Social Sciences, the School of Social Ecology, the Paul Merage School of Business, the School of Law, the Department of Population Health & Disease Prevention and the Bren School of Information and Computer Science. Collectively, scholars from these schools and departments have conducted highly regarded research in: transportation systems operations, simulations, and control; transportation and land-use systems planning and modeling; sustainable transportation technologies and policies; transportation economics and finance; and freight modeling and evaluation. ITS-Irvine also serves as the administrative headquarters for the UC Office of the President Multi-campus Research Program and Initiative (MRPI) on Sustainable Transportation: Technology, Mobility and Infrastructure.

- **UC Los Angeles.** The UCLA Institute of Transportation Studies (ITS) is one of the leading transportation policy research centers in the nation. Research by UCLA scholars has led directly to changes in both state law and the federal Internal Revenue Code regarding the taxation of parking to increase commuting by alternative modes, was cited specifically by former President Clinton in announcing changes to federal welfare policy, and has led to the institution of fare-free transit for UCLA students, staff, and faculty. ITS's transportation faculty and research staff have backgrounds in economics, engineering, geography, public finance, urban planning, policy, and architecture and urban design. Because of the variety of research methods, approaches, and specializations of expertise, UCLA researchers have demonstrated ability to apply a variety of approaches to solving increasingly complex problems in transportation and related fields of land use, environment, and community and economic development.

- **UC Riverside.** Much of what UC Riverside does in transportation focuses on environmental sustainability. At the center of this research is UCR's Center for Environmental Research and Technology (CERT). CERT has several thrust areas that deal with energy and environmental issues of transportation. The Emissions and Fuels research group conducts extensive emissions testing and analysis for a wide variety of transportation modes (cars, trucks, ships, locomotives, and airplanes). This research focuses on examining emissions impacts of alternative and low-carbon fuels. This research is carried further through studying the smog-forming potential of the emissions within Atmospheric Processes group. CERT's Intelligent Transportation System (ITS) research group is also very active in environmental sustainability, designing ITS applications (e.g., Dynamic Eco-Driving; Eco-Routing Navigation Systems; Mobile Energy Emissions Telematics System) aimed at reducing pollutants and energy consumption. In addition, the Sustainable Energy research group is developing sustainable, alternative, low-carbon fuels such as cellulosic ethanol and synthetic diesel fuel. CERT is composed of both researchers and faculty from various departments including mechanical, chemical/environmental, and electrical engineering. Also on campus is the Center for Sustainable Suburban Development (CSSD), which examines issues related to suburban growth, new urbanism designs, and environmentally friendly modes of travel. UCR researchers are also active in vehicle automation, developing new systems that improve the performance of automobile through better sensors and controls. Research has examined lane-level positioning, using both on- and off-board sensing techniques that employ the connected vehicle concept, i.e., infrastructure-to-vehicle, vehicle-to-infrastructure, and vehicle-to-vehicle communications.

- **UC Santa Barbara.** Transportation research and education at UCSB is based in the GeoTrans laboratory

and emphasizes the application of Geographic Information Science within four specialty areas: behavioral dynamics and large-scale modeling and simulation; optimal facility location, logistics, and corridor planning; cartography and spatial modeling using remote sensing and real-time data collection; and data models for remote sensing, Geographic Positioning Systems, and Geographic Information Systems. These activities are administered through UCSB's Department of Geography. Research and education collaborations include the Department of Computer Science, the Center for Spatial Studies, the Los Alamos National Laboratory, and other government agencies. All four specialty areas provide important methods, techniques, and substantive knowledge on integrated transportation-demographics-land use models that estimate and predict behavioral response to policy initiatives including transportation demand management or smart-growth planning and design. UCSB researchers have also developed METRIS (a port synchronization system employing real-time geospatial technologies); First Responders System Testbed (FiRST), which integrates transportation and communication modeling and simulation for emergency preparedness and response; SLEUTH, a cellular automata urban growth model applied worldwide; and SimAGENT a large-scale agent-based regional simulation model system designed to address SB 375 policy questions in the Southern California region.

It must be emphasized that transportation scholars across the six UC campuses that form our consortium do not work in isolation. Rather, we have a long-standing tradition of close collaboration that draws upon the many specialized skills and talents of faculty and students from throughout UC. An example is the development and implementation of large-scale transportation-land use models for evaluating sustainable communities plans and scenarios in response to SB 375. The California Department of Transportation (Caltrans) and the state's largest metropolitan planning organizations (MPOs) have partnered with UC campuses to conduct the first-of-its-kind California Household Travel Survey (CHTS)—one-day activity diaries of 60,000 households throughout California supplemented by GPS tracking of persons and cars and on-board diagnostics of vehicle emissions. Using survey results, faculty and researchers from three UC campuses of our consortium have spearheaded the following efforts: UC Davis—statewide travel-demand modeling and forecasting; UC Riverside—on-board diagnostics and emissions modeling using Nustats; and UC Santa Barbara—model pre-testing, design, oversight, and training.

A.3 DESIRED OUTCOMES

A principal objective of our consortium is to conduct rigorous, cutting-edge research in the areas of *environmental sustainability*, *economic competitiveness*, and *livability* that impacts and informs transportation policy, practice and education in meaningful and lasting ways. We will use the following performance metrics to measure success:

1. Number of peer reviewed publications and subsequent citations, such as reflected in the Science Index (SI) and Social Science Index (SSI);
2. Evidence that our research has led to the deployment of new technologies or analysis methods by state or federal transportation agencies as well as private industry, or has informed policy at the local, state or national level; and
3. Number of conference presentations and invited presentations by faculty at national and international conferences.

For tracking purposes, we will use Internet resources such as Google Scholar (for metrics related to scholarship) and annual surveys of UC faculty for metrics related to deployment and policy adoption.

b. LEADERSHIP

This section further discusses our academic standing in the field, prior experience and plans for continued leadership. Also see Section *a* for additional information of our leadership in scholarship and impact.

B.1 ACADEMIC STANDING AND PRIOR EXPERIENCE

The high standing of UC scholars is revealed by influential publications, presentations at major conferences, and appointments to important leadership positions.

UC faculty have published more than 1,020 papers in leading journals over the last five years on a rich array of topics. Our research is widely cited (see Section *a*, Table 1) and highly influential. Faculty and graduate student research also routinely wins awards from TRB, such as the Pyke Johnson award, and Council of University Transportation Centers (CUTC) awards. These achievements attest to the immense impact of UC faculty on transportation scholarship. Faculty also serve on the editorial boards of the key transportation journals, are regularly invited to give keynote speeches worldwide, and chair important committees and task forces of the National Research Council's Transportation Research Board and committees of the National Academy of Science.

UCTC faculty also make sure others know about research findings. Our faculty give numerous presentations at numerous conferences in the US and abroad each year. For UC Berkeley alone, faculty and students have authored an average of 50 papers per year at recent annual meetings of the Transportation Research Board.

The impact of our transportation programs goes well beyond scholarly publications and presentations. UCTC research has also informed and shaped policy on important contemporary topics of the day, as discussed in Section *a* (see Sections *a.1.1* to *a.1.4* and *a.2*). We will continue this leadership with the following planned actions:

- Chair and actively participate in committees of the National Academy of Sciences and Transportation Research Board as well as local, state, and regional agencies;
- Provide briefings and invited testimony to legislative and policy bodies, such as the US Congress, state legislatures, private industry leaders, community groups, MPOs and transit agency boards and local jurisdictions;
- Play a significant role in major policy efforts through providing advice and background evidence to key officials and authoring major reports that will receive wide exposure to policymakers and researchers, including the human settlements and infrastructure chapters of the Fifth Assessment of the International Panel on Climate Change (IPCC) and UN-Habitat's 2013 *Global Report on Sustainable Transportation*; and
- Discuss research findings and publish editorial pieces with national and local press and media so that our work reaches a broad audience.

B.2 PERFORMANCE METRICS

The metrics we will use to measure our Center's leadership will include:

1. Number of articles published in the leading transportation journals and subsequent citations;
2. Number of conference presentations and invited presentations by faculty at national and international conferences;
3. Evidence that our research has led to the deployment of new technologies or analysis methods by state or federal transportation agencies, or has informed policy at the state or national level;
4. Number of elected and public officials with whom we interact on policy and planning related matters, at conferences, briefings, and workshops, and during service on committees; and
5. Public service activities such as appointments to boards, committees, and advisory panels.

For tracking purposes, we will use Internet resources such as Google Scholar (for metrics related to scholarship) and annual surveys of UC faculty for metrics related to deployment and policy adoption.

c. EDUCATION AND WORKFORCE DEVELOPMENT

UCTC will build on its excellent history of education and workforce development to ensure that we are educating the next generation of professionals at the highest levels of expertise. We will continue to dedicate substantial financial support to graduate students through fellowships, dissertation grants, and research positions with faculty. Our consortium will also support new course development to bring the latest technical and policy-related knowledge across disciplines to the classroom. In addition, we have been increasing our support of undergraduates through special classes and outreach, and will continue to do so. As described below, we also will dedicate funds to partner with our new California State University (CSU) consortium members to enhance workforce development.

c.1 DEGREE PROGRAMS AND ACADEMIC STANDARDS

The UC campuses offer 21 degree programs at the masters and doctoral level in transportation engineering, ITS/technology, transportation planning/policy and also in the departments of geography, public policy, and related disciplines within civil and environmental engineering. An average of 134 graduate students have receive degrees each year in these programs. Numerous undergraduate courses are offered to attract students to the field, including degrees that offer specialization in transportation.

Several departments are highly ranked, which is evidence of our high academic standards. For example, UC Berkeley's Civil Engineering Department was ranked first in the *US World and News Report* survey of graduate engineering programs, and more recently, its Ph.D. program was ranked first by the National Research Council. Transportation planning programs at both UCB and UCLA have been ranked by Planetizen in the top 3 of nearly 100 urban planning programs across North America. UCSB's Geography Department, where UCTC supports GIS-based transport research, is routinely ranked as one of the top geography departments nationwide. UC students also are regular recipients of prestigious fellowships, including from USDOT's Eisenhower Program, the Eno Transportation Foundation, and Women's Transportation Seminar.

c.2 COURSEWORK AND EXPERIENTIAL LEARNING

Many classes and degree programs mounted by academic units part of our consortium provide opportuni-



The undergraduate transportation class site visit to Caltrans' District 4.

ties for experiential learning through “hands-on” assignments and capstone projects developed for agency and non-profit organizations. Thus, students “learn by doing” while developing essential skills. Several campuses offer studio courses where students work with a local client for whom they develop recommendations. For example, UC Berkeley’s urban planning department regularly holds studio courses in which students develop and present detailed

analyses and recommendations to mayor’s offices, MPOs, and transit agency staff and members of the community. Examples include proposals for Third Street Light Rail in San Francisco, context-sensitive street designs in Berkeley, and San Francisco and station area planning and parking policies for the Bay Area Rapid Transit District (BART). Studio work also has formed the basis for journal articles published in the *Transportation Research Record*. According to some agency staff attendees, they attend the studio presentations to learn from the students, and to meet the next generation of practitioners they may recruit for internship and professional positions.

C.3 WORKFORCE DEVELOPMENT

Our consortium regularly supports conferences, symposia, and workshops. These events are targeted to the public to educate and draw in the local workforce of transportation professionals. A notable example is UC Berkeley’s Technology Transfer Program, which offers a large number of continuing education courses and training seminars for practicing professionals. Annually, more than 100 such courses and seminars are offered through the Local Technical Assistance Program (LTAP).

Our California State University partners also excel in this area. (For additional information, see Section g). Cal Poly Pomona regularly offers training courses to transportation engineers and planners from regional and local transportation agencies, and to date to over 1,000 Caltrans engineers. Cal Poly Pomona’s GIS Research Center conducts training courses for working professionals and others who are making career changes to GIS and transportation.

At Cal State San Bernardino, the Leonard Center has worked with San Bernardino County Workforce Investment Board and Department of Workforce Development to host annual workshops that help businesses recruit and train their employees with government assistance. The center has developed an online



Planners and local officials review students' work in a Berkeley planning studio.

sustainable transportation and logistics certificate program for working professionals that will be offered in spring 2012. It also works with the CSU Chancellor's Office to develop statewide continuing education and distance training programs for professionals. In addition, it has partnered with the California Transportation and Logistics Institute, a consortium of transportation and logistics programs at community colleges, to recruit students into transportation programs. Similarly, Sacramento State works with the local chapter of the Institute

of Transportation Engineers (ITE) to host webinars and outreach efforts to attract students into the field.

We will leverage this experience and dedicate funds to support collaborative workforce and education development activities between the UC and CSU campuses. Initial proposals include:

- Developing a seamless transfer template for community colleges to connect with four year universities for smooth transfer to transport-related programs. We plan to develop a template for CSU undergraduates to apply to UC graduate programs;
- Collaborating with state and county workforce investment boards to identify and develop training materials, modules, and skills building materials to prepare future professionals for transportation careers;
- Organizing workforce development conferences and workshops to share knowledge and experiences with various states and cities and to address their unique issues and challenges;
- Sponsoring UCTC and CSU researchers to develop training workshops and tutorials for CSU students and professionals;
- Collaborating with community colleges and CSUs to provide workforce training and retraining in transport-related fields for unemployed workers; and



Audience at the 2011 UCTC Conference.

- Incorporating use of distance learning tools at the CSUs in introductory level and continuing education courses.

c.4 CAREERS AFTER GRADUATION

Our students routinely secure key professional positions in the field and are later promoted to prominent management positions at public agencies (MPOs, cities, counties, transportation agencies), private industry and non-profit organizations throughout the California and the US, including as key USDOT appointees within the Administration. We also have been remarkably successful with Ph.D. graduates securing top university teach-

ing and research positions across a wide range of specialty areas. As an additional benefit, our current graduates will be able to take advantage of this diverse alumni network to inquire about positions and conduct informational interviews.

c.5 PERFORMANCE METRICS

We propose the following metrics to measure our education and workforce development program's effectiveness:

1. Number of graduate students admitted to the transportation programs by campus degree program, and the number of undergraduate students who choose transportation as their area of specialization;
2. Number of graduates of our programs who achieve high levels of distinction in academia, industry or government;
3. Number of event registrations;
4. Number of programs and participants at different levels (K-12, community colleges, 4-year university and graduate programs, working professionals); and
5. Number of students from CSU students admitted to UC campuses.

To track outcomes, we will maintain records and conduct follow-up surveys of students and participants.

d. TECHNOLOGY TRANSFER

Technology Transfer has long been a focus of UCTC because it is critical in informing and influencing transportation policy and practice. This section discusses our planned activities for research dissemination, past experience, and proposed performance metrics to track progress.

D.1 PLANNED ACTIVITIES FOR MOVING RESEARCH INTO PRACTICE

The UCTC consortium is planning several activities to continue and expand its technology transfer program, which include:

- Issuing UCTC's highly acclaimed *Access* magazine, which has over 230 articles appearing in 38 issues of eminently readable language. It is distributed free to nearly 14,000 hard copy subscribers and 2,800 online subscribers. The latest online issue has received 1,500 page views to date;
- Publishing two-page succinct research fact sheets for our Policy Briefs series for policymakers and practitioners (see Appendix C for a selected Policy Brief);
- Starting two new series: a Policy Synthesis Series where we will distill UCTC-supported research from several papers on a particular topic into a 5- to 7-page brief for policymakers and staff, and a Technical Briefs series for technical staff at public agencies and industry;
- Placing our work in professional publications and newsletters (e.g., ITE, Women's Transportation Seminar, Urban Land Institute, and American Planning Association);
- Participating in a webinar series co-organized with Caltrans and other UTCs in Region 9 for practitioners with presentations by our faculty;
- Taking a lead role organizing a conference to support the USDOT/RITA research cluster on livability, where we would invite leaders in this area from across the US, including Region 9. We will also participate in discussions on the research clusters website to share information and communicate with other researchers. We could contribute to discussions in particular on visual simulations, streetscape designs, and transit-oriented development; and
- Contributing to peer-reviewed journals or academic publications to showcase our research results, including *Transportation Research Record* and other publications of the National Academy of Sciences, *Accident and Prevention*, *Environment and Planning*, *International Journal of Sustainable Transport*, *Journal of the American Planning Association*, *Journal of Planning Education and Research*, *Journal of Public Transportation*, *Public Works Management and Policy*, *Transportation*, *Transportation Research (A-E)*, *Transport Policy and Urban Studies* as well as journals focusing on Intelligent Transportation Systems, GIS and goods movement.

Importantly, we will collaborate with the California State Universities in our consortium to leverage resources. For example, we will coordinate with the Leonard Center, which produces audio and video podcasts from its research projects and conference presentations for free distribution via its website and Apple's iTunes U. We will also post materials on the Center's channel on slideshare.com.

We will also continue to develop social media-based outreach to facilitate communications with colleagues on other campuses. The UCTC communications director has taken part in a recent TRB webinar on social media in transportation and will continue to participate in TRB social media activities. The director also is a member of the TRB Committee on Transportation Visualization and is the communications coordinator for the new subcommittee on transportation and health. We will further tailor outreach efforts based on responses and needs of our diverse audience, ranging from researchers to those engaged in workforce development.

D.2 PRIOR EXPERIENCE

UCTC and its consortium members have long been pro-active in outreach, dissemination, and technology transfer. Highlights of our efforts, in addition to *Access* magazine, include:

- UC Berkeley's Technology Transfer Program, which provides training workshops, conferences, technical assistance and information resources in the transportation-related areas of planning and policy, traffic engineering, project development, infrastructure design and maintenance, safety, environmental issues, railroad and aviation. Tech Transfer serves more than 25,000 public and private transportation agency personnel working for California's 476 cities, 58 counties, over 50 regional transportation planning agencies and Caltrans.
- California UTC-Caltrans webinar series, which featured numerous faculty presentations targeted to public agency managers and staff. UC Davis led this outreach effort with active participation by UCTC, Metrans (USC/California State University, Long Beach) and the Mineta Institute at San Jose State.

Many UCTC faculty grants are also applied research, and in the case of UC Riverside significant data are provided to federal and State agencies to better establish modeling tools on which policy is based. These data also are used extensively by industry in improving their technology. Examples include recent emissions measurements of ocean-going vessels (i.e., cargo ships) that were used as a basis to establish new port activity rules imposed by the California Air Resources Board. This same emissions database is being used by EPA for future rule making. From an industry perspective, emission data sets and their analysis on the effectiveness of heavy-duty diesel engine after-treatment devices are being provided to manufacturers so that they can better meet recent new certification rules set by EPA. Similar results on the effectiveness of new fuel additives in reducing emissions are being provided to the fuels industry. In addition, real-world vehicle performance data on new vehicle technology allows automakers such as Nissan and Honda to better gauge market acceptance.

At UC Berkeley, researchers are completing a one-year independent evaluation of congestion pricing on the San Francisco-Oakland Bay Bridge at the request of the Bay Area Toll Authority, which oversees the bridge and is an agency affiliated with the Metropolitan Transportation Commission. UCLA researchers are working on a Caltrans-funded project to develop an online decision support tool available for transit agencies to evaluate improvements to transit stops, stations, and service. The tool will allow transit agencies to replicate a survey and methodology developed by UCLA researchers to evaluate the most important improvements needed to most effectively increase customer satisfaction. The web-based tool and technical support will be publicly available to transit agencies.

Further evidence of our strong record in technology transfer is the number of firms started by UC Berkeley transportation faculty, which have taken the results of the faculty's research and helped to commercialize it. A notable example is a recent start-up which has helped commercialize wireless sensor networks developed by engineering faculty for traffic monitoring on freeways and city streets.

UC Riverside has received approximately 15 patents related to transportation and fuels research. Seven of these US patents (and their seven international patent counterparts) are in carsharing technology. Another provisional patent has been received in eco-routing navigation technology. The remainder of patents are in new hydrogasification techniques that produce clean synthetic diesel fuels. Several patents are being licensed by industry and used in real-world practice.

D.3 PERFORMANCE METRICS

We propose to use the following metrics to measure the impact of technology transfer initiatives:

1. Number of events and participant registrations (in person and online);
2. Number of tech transfer related articles by publication type and venue;
3. Number of citations of research in the media;
4. Evidence of use of our research in policy adoption (such as embodiment in city or federal codes for example); and
5. Number of downloads/views of UCTC publications on UCTC and affiliated websites as well as on iTunes U and slideshare.com.

To track outcomes, we will survey our faculty, conduct citation searches of our research in publications and media databases, maintain records on the number of downloads, and conduct follow up surveys with tech transfer participants.

e. COLLABORATION

Collaboration between faculty, students, industry, and the public sector is vital to efficiently and effectively implement our programs. The professional networks we have established during our past 23 years provide a strong foundation for enduring collaborative relationships and future work (see Appendix C, Letters of Support).

E.1 COLLABORATION PLANS WITH OTHER UNIVERSITIES AND ROLES/RESPONSIBILITIES

Our team is a consortium of six University of California campuses, including UC Berkeley, UC Davis, UC Irvine, UC Los Angeles, UC Riverside, and UC Santa Barbara. Each campus has developed unique strengths in one or more areas of transportation research, as discussed in Section *a*, particularly Section *a.2.2*. Faculty from the other UC campuses of UC Merced, UC San Diego, UC Santa Cruz and UC San Francisco also are eligible and invited to participate in UCTC activities.

Our consortium will be expanding to include strong partners from the California State University (CSU) system (Pomona, San Bernardino, Sacramento, and San Luis Obispo campuses). CSU partners excel in undergraduate education, workforce development and professional training, and collaborative research in economic competitiveness, environmental sustainability, and livability. These campuses will enrich the socio-demographic base of UCTC activities by bringing students and professionals from under-represented communities into the transport field, through education, technological transfer, and collaborative research.

UCTC's Executive Director, UC Berkeley Professor Robert Cervero, will provide overall leadership of the UCTC consortium and work directly with the six UC campuses through UCTC's Executive Committee (see below). The UCTC headquarters office will oversee all primary activities, including USDOT, State, and other federal reporting requirements. It will distribute grants (also called "subawards") to the campuses for education, tech transfer, and workforce development (see budget section). For those grant activities, the campuses will be the lead entities and will inform UCTC headquarters office through regular reporting.

As discussed in the Regional Center application section, UCTC also will coordinate research and educational activities with UTCs in neighboring parts of the southwest (Arizona, Guam, Hawaii, and Nevada), including collaborative projects, joint participation in research-oriented conferences, and soliciting contributions from these UTCs for *Access* and other UCTC publications.

E.2 PLANS FOR ADDITIONAL COLLABORATIONS

UCTC will strive to further link our center's core activities to other entities. From the very beginning, Caltrans has been an important and vital partner of UCTC's consortium, helping to guide its research agenda, applying research findings and recommendations to multi-modal practice, and participating in and sometimes spearheading forums that allow scholars and practitioners to interact (see Appendix C, Letter of Support from Caltrans).

We will host webinars, workshops, and conferences to continue to draw in MPOs and other public sector organizations at all levels. We also will advertise future events and invite participation as appropriate to the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), the American Public Transportation Association (APTA), Women's Transportation Seminar, Association of Metropolitan Planning Organizations (AMPO) and private industry. Further connections to TRB will be achieved through faculty and student participation on numerous TRB committees, and faculty will continue to provide technical assistance and advice to AASHTO and APTA.

The UCTC campuses will also work through the several Hispanic-serving institutions and others in our consortium (UC Riverside, CSU Pomona, CSU San Bernardino) to build relationships with minority-serving institutions and broaden our network of outreach, learning, and research dissemination. Importantly, we also will continue to collaborate with private industry by building on our past joint work as discussed in Sections a and d.2.

E.3 ADVISORY COMMITTEES

UCTC has two main committees that will continue to provide direction and strategically guide activities: an Executive Committee and Advisory Committee.

The UCTC Executive Committee is a faculty committee that sets the overall policy direction for the Center and assures coordination with the major transportation research and education groups on the various campuses. The Executive Committee consists of the UCTC Director plus faculty representatives of the six UC campuses, spanning the directorships of the various campuses' Institutes of Transportation Studies or their representatives as well as other transportation-related institutes. This representative membership facilitates information exchange about education programs, recruiting, and other academic matters and aids in the coordination of research among the campuses and research units.

The Executive Committee is responsible for: 1) working with the Director in consultation with USDOT, Caltrans, and transportation advisors to identify and designate specific subject matter priorities for research funding in a particular year; 2) setting rules for allowable expenditures on research projects, consistent with USDOT and Caltrans requirements; 3) conducting an annual review of the Center's overall performance and resources, and redirecting funds and activities as necessary; and 4) when the Directorship of UCTC becomes vacant, selecting a new director. Members of the UCTC Executive Committee meet in person at least once a year and transact business in the interim through telephone conference calls and e-mail.

The UCTC Advisory Committee is composed of leading transportation experts who help us identify key

areas of research for our annual faculty research call for projects, and advise on research, education, and tech transfer needs. It will also include a representative from our new CSU partners that will rotate among the campuses. Previous members were affiliated with Caltrans, City of Los Angeles, Federal Highway Administration, Metropolitan Transportation Commission, San Francisco County Transportation Authority, Massachusetts Institute of Technology, and Urban Land Institute.

The Advisory Committee meets with the Director and Executive Committee during the annual UCTC conference. During the conference, several committee members also participate on a special panel to present on their areas of expertise. Committee meetings also are held by teleconference from time to time to minimize travel and expense.

E.4 PRIOR EXPERIENCE

The core group of the six UC campuses has an outstanding record of collaboration. A few examples and outcomes include:

- The integration of the advanced traffic monitoring technologies currently developed by researchers at UC Berkeley (based on GPS-enabled cellular phones) with the unique vehicle emission measurement tools developed at UC Riverside. Of note, USEPA and the California ARB have certified these as the gold standard for on-road testing;
- UC Pavement Research Center (PRC), a collaboration between UC Davis and UC Berkeley, uses innovative research and sound engineering principles to improve pavement structures, materials, and technologies while emphasizing environmental sustainability. Research funding has totaled over \$21 million since 2006, and the Center's researchers have produced over 50 publications; and
- Urban Land Use and Transportation Center (ULTRANS), launched in 2008 at UC Davis, focuses on the relationships between land use, transportation infrastructure, and government policy. Its researchers have contributed to the empirical evidence-based and state-of-the-art forecasting tools that support the development of policies that encourage sustainable cities and regions. Faculty from UC Santa Barbara and UCB have and will continue to collaborate with ULTRANS on land-use and transportation modeling and forecasting. Funding from state agencies and private foundations has so far totaled \$7.8 million, and the Center has produced 29 publications and given over 120 presentations.

E.5 PERFORMANCE METRICS

We will use the following metrics to measure the effectiveness of collaborative efforts:

1. Number of collaborative activities;
2. Number of participants in our collaborative activities by type;
3. Number of meetings by committee type;
4. Number of publications from these collaborations (peer-reviewed and professional); and
5. Evidence of specific outcomes of these efforts, such as new relationships and additional activities that have resulted from these collaborations.

To track outcomes, we will gather information through surveys with participants and maintain a detailed record on meetings held, including their respective attendees and agendas.

f. **PROGRAM EFFICACY**

UCTC is a lean operation with a small core staff that works with a diverse network of partners and researchers statewide. This section details our vast institutional resources, management, and oversight, including research tracking and coordination.

F.1 INSTITUTIONAL RESOURCES

UCTC draws upon a variety of institutional resources at participating campuses, including the administrative services of researchers' academic departments and research institutes. Research centers are located at the six UC campuses, which have substantial institutional resources and support capabilities to carry out UCTC activities (see Section B for a listing of the centers and associated resources). Two noteworthy examples are:

- UC Riverside's EPA-certified Mobile Emissions Laboratory (MEL) allows researchers to monitor engine emissions in real world driving conditions, such as traffic level, temperature and grade. UCR also has recently installed a state-of-the-art heavy-duty chassis dynamometer that has the capability of testing class 8 vehicles, buses, and smaller yard goats and other applications. There also is an in-ground dynamometer for cars and light duty vehicles and a heavy-duty engine dynamometer for diesel engines. UCR has also been a pioneer in developing Portable Emissions Measurement Systems (PEMS) and has several available. The Atmospheric Processes Laboratory allows research at realistic levels of pollution, rather than the artificially inflated levels necessary for earlier, less sensitive chambers. The chamber can control for temperature, humidity, and light intensity and is used extensively for research on particulate formation; and
- UC Santa Barbara's GEOTRANS Laboratory contains an extensive network of servers and desktop computers that are able to handle the massive amount of data required for GeoSimulation projects. In 2010-2011, Geotrans had three postdoctoral scholars working fulltime and 15 graduate students working at 20 hours/week. The lab also hosts visiting scholars and undergraduate researchers, and is supported by an IT manager on an hourly basis. Funding for the Lab is provided by the University of California Department of Geography, the Center Spatial@UCSB, and the UC Office of the President.

UCTC's headquarters office is located at UC Berkeley, representing the eighth transport research center at Berkeley. Collectively, these centers constitute the Institute of Transportation Studies (ITS) at Berkeley (see Section *a.2.2*). ITS's non-UCTC centers focus on research in transportation technology, technology commercialization, aviation, pavements, safety, and transport in developing countries that are outside the scope of our proposed UTC.

For the other two themes of our proposal, Livability and Economic Competitiveness, while there is excellence in research at the University of California at Berkeley, there is no organized research center that would overlap with our proposed UTC. Therefore, our proposed UCTC would be complimentary to the existing transportation research centers at UC Berkeley.

For activities beyond UC Berkeley, UCTC will require that the sponsoring faculty provide written justification on how proposed UCTC-supported research activities may be different or related to, build on and, importantly, would be distinguishable from activities of the other centers. The UCTC Executive Commit-

tee also will review these statements to further ensure campus coordination.

F.2 PLANS FOR OVERALL MANAGEMENT AND OVERSIGHT OF FISCAL AND TECHNICAL ACTIVITIES

Management and oversight of UCTC's fiscal and technical activities will build on our 23 years of expertise at UC Berkeley, which has been the lead campus since inception. UCTC Director Professor Robert Cervero of UC Berkeley has provided overall leadership and management of UCTC fiscal and technical activities in recent years and will continue to do so if UCTC is selected.

UCTC strictly follows all USDOT, Caltrans and University of California reporting procedures. Contracting, accounting, and personnel support is provided by the business-service staff of UC Berkeley's Research Enterprise Services unit, Sponsored Projects Office, and the Extramural Funds Accounting unit. Participating research units and departments on other campuses also provide accounting and personnel services for their UCTC-related activities

To minimize administrative costs including administrative (F&A) shares, UCTC maintains a small staff with an off-campus office, thereby allowing the overhead rate to be reduced for certain portions of the budget from 53.5% to 26% (see Appendix B and budget forms). We also limit the amount of administrative, materials, and travel costs in the overall Center budget and faculty grants so that the majority of funds primarily support direct research, education/workforce development, and tech transfer activities.

F.3 PROCEDURES FOR TRACKING AND COORDINATING RESEARCH EFFORTS

UCTC requires that all faculty participating in research efforts provide status reports during our annual report process and submit a final research report upon project completion and for posting on the UCTC website. We also require faculty who conduct policy-related research to regularly develop a two-page research fact sheet for our new Policy Brief series or submit an article to *Access* or a trade publication for tech transfer and coordination purposes. For technical papers, faculty will be required to develop a two-page brief for our forthcoming Technical Briefs series intended for technical staff at public agencies and industry as well as researchers. Approximately 950 research papers and 11 policy briefs are currently available on our website.

We track the status of all research grants and related publications in our research papers database. We also ensure that research projects are completed on time by enforcing a strict rule that a Principal Investigator (PI) may only lead one funded research grant at a time, and the next project may not begin until the current project's completion. As a result, projects are completed on time and within budget. We will extend this rule as appropriate to the new collaborative research projects with faculty members of the CSUs and Region 9 universities. These grants also will be required to have at least one UC faculty member as the PI or co-PI.

To coordinate research efforts, Caltrans and outside peer reviews provide comments on all faculty grant applications. These reviews assess the proposed research contributions and merit, research design, and literature review. These reviews are critical to providing further assurances that our research is coordinated within the larger United States. In addition, we will review key research projects with our advisory committees as our program grows to include CSUs and other Region 9 universities.

We also will post our research papers on the UC System's eScholarship online repository, which makes the work immediately available to a broader audience. We also will continue to post research in progress through TRB's RIP website and work with UC Berkeley's Institute of Transportation Studies to include

our reports in the TRIS/TRID database.

g. DIVERSITY

Our consortium is committed to enhancing diversity by broadening participation of under-represented communities in transportation research and careers. The UCTC campuses have made considerable advances in increasing student diversity and opportunities for female students. In fact, *U.S. News and World Report* ranks UC Riverside as the fifth most diverse university in America. Riverside also is one of America's most diverse research-intensive universities, and an accredited research-intensive Hispanic Serving Institution (HSI). At the undergraduate level, Riverside is one of the country's most successful institutions for graduating students from under-represented ethnic groups. At the graduate level, the Bourns College of Engineering has the most diverse domestic student population in the UC system—nearly 25% from under-represented groups.

Another noteworthy example is UCLA's Urban Planning program, which targets fellowship funds to retain its high levels of student diversity with nearly 30% of its student body from under-represented communities. And at UC Berkeley, UCTC student fellowship funds are used to attract and retain such candidates.

In addition, Berkeley Professors Joan Walker and Raja Sengupta will be hosting a three-week Science Technology Engineering Mathematics (STEM) based summer class on travel behavior, computer programming, and smart phone technology to two dozen high school students from under-represented communities for the second time this summer. The Google Foundation sponsors the class and the Leadership Education and Development (LEAD) organization recruits students from around the country to participate. UCTC also plans to host a STEM event this academic year for high school students at UC Berkeley with the Bay Area Women's Transportation Seminar chapter and its joint work with USDOT on the Transportation YOU program.

To greatly expand diversity efforts, UCTC has added four CSUs to our partnership (Cal Poly Pomona, Cal Poly San Luis Obispo, Sacramento State, and CSU San Bernardino). CSU campuses educate large numbers of under-represented student populations. Two campuses are Hispanic Serving Institutions (Pomona and San Bernardino). Our consortium will draw on their expertise, professional networks, and direct contact with diverse student bodies to socially, culturally, and ethnically enrich UCTC's educational, research, and tech-transfer activities.

Cal Poly Pomona's student population is particularly diverse, providing access to the transportation professions for students who may not gain a masters degree. Its Civil Engineering Program is one of the largest undergraduate civil engineering programs in the nation. It has over 1,200 undergraduate students, and about one out of three pursues a professional career in transportation. Importantly, Pomona is one of seven universities nationwide participating in the Transportation Research Board's Minority Student Fellow program. The College of Engineering's Maximizing Engineering Potential (MEP) program is a retention and academic enhancement program for engineering (including transportation engineering) and computer science students. The program's purpose is to increase the number and diversity of students who graduate in these technical disciplines, including those from historically under-represented groups.

In addition, Cal Poly San Luis Obispo's Engineering Department actively strives for cultural diversity. Its Cal Poly Multicultural Engineering Program (MEP) supports the recruitment and retention of disadvantaged students in engineering and computer science to achieve success. The College of Engineering also has offered a unique summer outreach program for the last eight years to K-12 students, the Engineering Possibilities in College (EPIC) program, to attract students to engineering from diverse and disadvantaged

backgrounds locally and across the nation. Classes and demonstrations include transportation engineering and electronics.

Cal State San Bernardino's Leonard Transportation Center has worked with the public and private sectors to recruit and train the next generation of transportation workforce. Its programs were featured by a presentation by HACU (Hispanic Association of Colleges and Universities) at the FHWA Minority Conference in Atlanta this year. The Leonard Center has two key scholarship programs with: 1) student support and program building for the diesel technology program at San Bernardino Valley College, another HIS; and 2) support for members' and corporate members' employees of a professional association to pursue a transportation-related degree. The Center also has been developing plans with the local school district to increase interest among women and minority students in STEM disciplines and career opportunities by enriching the high school science curriculum with transport topics and field trips. Partners include Caltrans and the Women's Transportation Seminar Inland Empire Chapter.

Sacramento State is also actively working to attract more young people to the sciences. The Mathematics, Engineering, Science Achievement (MESA) Program provides an opportunity for educationally disadvantaged students to become actively engaged in the exploration of STEM careers. The Sacramento State/UC Davis MESA Program offers academic support to students in grades K-12 in preparation for college/university admission. Precollege programs include math, science, and engineering competitions, field trips, STEM career explorations, preparation for enrollment into rigorous and challenging curriculum including honors and Advanced Placement (AP) coursework, college entrance exam preparation, and encouragement to students to assume leadership roles and engage in civic service opportunities.

In addition, Sacramento State houses a Center for STEM Excellence, which brings together the broad range of STEM disciplines. The Center is building a coalition of industry leaders, educators, community, and local government agencies who have begun to collaborate. The goal is to create a seamless pipeline for attracting, educating, graduating, and employing high-technology workers that spans K-12 education, the community college system, universities, and area employers.

To further enrich diversity at UCTC, we will leverage our collective resources and experience, and dedicate funding on a number of fronts including potentially:

- Participating in STEM-related programs at the CSUs and UCs;
- Assisting undergraduate CSU students in developing and completing senior projects in transport, such as the partnership between Cal Poly Pomona and Caltrans to jointly develop projects for undergraduate students;
- Mentoring of CSU students by faculty and increasing undergraduate opportunities for paid research training and experience by working in diverse teams with faculty and graduate student mentors;
- Developing a student summer program to provide CSU student opportunities to work with UCTC researchers on research projects and to work with practitioners on professional projects;
- Developing a pre-Ph.D. preparation program with CSU and UC campuses to establish a bridge between students and faculty;
- Supporting educational exchange between UC and CSU faculty to give presentations to classes and ITE student chapters on other campuses; and

- Supporting students to attend UCTC events, particularly the annual UCTC conference with students and faculty, and other transportation conferences.

e. REGIONAL CENTERS

E.1 UCTC AS A REGIONAL FOCAL POINT AND PLANNED ACTIVITIES WITH OTHER UTCs

Our three proposed research themes address key transport challenges in California and other southwestern states. We are fully committed to being the focal point for UTC activities throughout Region 9.

As the Region 9 UTC, we will work pro-actively with partner institutions in the southwest region (including Arizona, Hawaii, and Nevada) to coordinate transportation research and educational activities. In preparing this proposal, we have contacted our counterparts at Arizona State University, University of Hawaii, and University of Nevada, Las Vegas, and can report that all have expressed their enthusiastic support and commitment to participate in our proposed Region 9 activities.

Our center also regularly collaborates with other California UTCs, and UC Davis, a UTC, is now officially part of our proposed new consortium. In addition, we have worked for many years with San Jose State's Mineta Center and Metrans (with University of Southern California and California State University Long Beach). We would build on this strong foundation to continue collaborations in education and technology transfer.

To take advantage of and maximize our collective services and programs, UCTC would spearhead the following activities in the region:

- **Workforce Development:** Offering professional extension courses, primarily to practicing transportation professionals. UC Berkeley has a fairly active extension program, which offers subsidized courses to practicing transportation engineers and planners. Offering courses jointly between such programs across our consortium and other Region 9 universities would expand workforce development. This would build on work and collaborations proposed in the Workforce Development section of this application (see Section c);
- **Education:** Inviting graduate transportation students from non-UC Region 9 universities to participate in the annual UCTC student conference, where graduate students present their research. The UCTC student conference rotates annually among the six UC campuses that participate in the Region 9 UTC;
- **Technology Transfer:** Performing tech transfer activities that benefit state DOTs from all Region 9 states. There is, currently, an arrangement between Western State DOTs to jointly fund research in areas such as Pavement Materials and Technology. This arrangement could be expanded beyond Pavement Technology, focused on Region 9 states;
- **Regionally Relevant Research:** Partnering between UCTC and Region 9 faculty on a new collaborative research program. We will encourage faculty from outside UC to collaborate with UC faculty researchers on research projects, reaching cost sharing arrangements that maximize resources; and
- **Publications:** Inviting Region 9 faculty participating in UCTC-supported activities to co-author *Access* articles, Policy Briefs, and Technical Briefs. Also seeking wide publication of this research in

peer-reviewed and professional publications.

E.2 EXPERIENCE IN LEADING REGIONAL EFFORTS

UCTC has considerable experience working with other UTCs in California and beyond. We were the lead organizers of a California UTC-PATH conference with Caltrans for two years that had 200 practitioners, researchers, and students in attendance each year. All of the California UTCs participated in this effort, and UTCs in Region 9 were invited to attend. In addition, UC Davis, with the active participation of UCTC and the other California UTCs, led a California UTC-Caltrans webinar series, which featured faculty presentations targeted to public agency managers and staff. We are also very proud of the annual UCTC conference, which brings together students and faculty. Students from other California UTCs regularly attend, and we will make a special effort to have students from other Region 9 universities attend.

Other notable efforts that demonstrate extensive coordination and leadership include:

- UCLA's Transportation-Land Use-Environment Connection, an annual symposium at the UCLA Lake Arrowhead Conference Center organized by the UCLA Institute of Transportation Studies and the UCLA Public Policy Extension Program, and sponsored by over two dozen public and private organizations. Approximately 125 senior officials and researchers are in attendance for these high-level policy discussions. UTC faculty in the region are often invited to speak and participate;
- UC Santa Barbara provides technical support to California agencies in developing state-of-the-art data collection methods such as the California Household Travel Survey 2010 (a partnership of Caltrans with the California Energy Commission, and many of the MPOs in the State), and to small and large regional agencies in building their simulation models using techniques directly emerging from UCTC. The faculty members also help agencies in neighboring states such as Oregon and Arizona and others by providing peer review of their model building efforts; and
- The Road Ecology Center, established in 2003 at UC Davis, brings together researchers and policy makers from ecology and transportation to design sustainable transportation systems based on an understanding of the impact of roads on natural landscapes and human communities. Funding has come from Caltrans, FHWA, TRB, Wildlife Conservation Society, and the California Department of Fish and Game. The center is a sponsor of the International Conference on Ecology and Transportation and the convener of the biennial California Connectivity Forum.

E.3 POSSIBILITIES FOR USING REGIONAL EFFORTS TO ADVANCE UTC PROGRAM OBJECTIVES

We envision that our regional efforts will provide significant opportunities to engage in policy-relevant discussions, research, and education/workforce development with the key goal of advancing UTC program objectives. Possibilities for using regional efforts to advance the UTC program include:

- Participating with other Regional Centers, USDOT and CUTC in a national workshop to share success stories and lessons learned. This could build off of CUTC work and be held in conjunction with the annual CUTC conference. Regional centers also could have webinar-based meetings from time to time for information exchange;
- Joining and collaborating with others in the USDOT RITA research clusters related to our proposed research program emphasis areas;
- Co-sponsoring and speaking at national UTC workforce development conferences. Also participat-

ing on conference organizing committees;

- Enhancing our research to practice outreach through: distributing *Access* magazine, our UCTC Policy Briefs, Technical Briefs, and Policy Syntheses to congressional offices and legislatures, US-DOT, CUTC, national organizations (e.g., AASHTO, TRB, APTA, WTS, ITE, APA, AMPO and ITS America) and other Regional UTCs, as appropriate; providing invited testimony to policy bodies; and discussing our research with national, regional and local media; and distributing our webinar announcements to the Regional UTCs, USDOT, and CUTC members; and
- Publishing research in peer-reviewed and professional journals and giving presentations at national and regional research and policy-based conferences. Based on our collective track record, we are confident that we will be able to share cutting-edge ideas that are both interdisciplinary and diverse, and build bridges for future collaboration.

***f.* CENTER DIRECTOR AND KEY STAFF**

The Center Director of the Region 9 UTC of the UCTC consortium will be Robert Cervero, Professor of City and Regional Planning and Carmel P. Friesen Chair in Urban Studies, at the University of California, Berkeley. Professor Cervero has been Director of the Region 9 UTC, University of California Transportation Center (UCTC), for the past three years and has been a full-time faculty member at the university since 1980.

As discussed in the Program Efficacy Section (Section *f*), UCTC rigorously tracks all activities and expenditures associated with the center and in accordance with all federal, UTC program, and State requirements. UCTC's Executive Committee (see Section *e*) assists the Center Director with program management. UCTC's Director will also represent the Center and participate in USDOT/UTC Director meetings.

In addition to the Center Director, UCTC's primary staff are Dr. Karen Frick, Assistant Director, and Lisa Simon Parker, Financial Administrator (see CVs in Appendix A). Dr. Frick has been UCTC's Assistant Director since 2007 and has extensive background in program management at the university and previously as the project manager for high-profile projects at the Metropolitan Transportation Commission, the San Francisco Bay Area's MPO.

Ms. Simon-Parker has significant years of experience at UC Berkeley in business administration and financial management. She has advanced knowledge of three areas critical to UCTC's success: 1) research administration policies and procedures in applicable sponsor and institutional regulations and guidelines; 2) complex university policies and procedures for purchasing, budget control, accounting, and payroll processing; and, 3) the processing of grants between universities in a timely and efficient manner.

APPENDIX A. CURRICULUM VITAE FOR CENTER DIRECTOR AND KEY STAFF

ROBERT CERVERO, CENTER DIRECTOR

Professor, City and Regional Planning
Carmel P. Friesen Chair in Urban Studies
Director, University of California Transportation Center
Director, Institute of Urban and Regional Development
University of California, Berkeley
228 Wurster Hall, Mail Code: 1850
Berkeley, CA 94720-1850
Telephone: 510-642-1695
E-Mail: robertc@berkeley.edu
Faculty web page : http://www.uctc.net/people/robert_cervero.shtml

EDUCATION

Ph.D., Urban Planning, University of California, Los Angeles, 1980.
M.S., Transportation Engineering; M.C.P., City Planning, Georgia Institute of Technology, 1975.
A.B., Geography, University of North Carolina, Chapel Hill, 1973.

PROFESSIONAL AFFILIATIONS

Chair: International Association for Urban Environments, Chinese Academy of Sciences (<http://www.iaue-net.org/>).
Chair: National Advisory Committee, Active Living Research Program, Robert Wood Johnson Foundation (<http://www.activelivingresearch.org/about/advisorycommittee>).
Member: Intergovernmental Panel on Climate Change, Editor, Chapter 12 on “Human Settlements”, 5th Assessment.
Member: Transportation Research Board; American Planning Association.
Editorial board member of nine academic journals.

AWARDS

Article of the Year, Journal of the American Planning Association, 2010 and 2003.
Dale Prize for Excellence in Urban and Regional Planning, 2004.
LeFrak Lecturer Award, University of Maryland, 2001.
Chester Rapkin Award, Journal of Planning Education and Research, 1991
Outstanding Teacher of the Year Award, Department of City and Regional Planning, UC Berkeley, 1988-89, 1986-87, and 1985-86.

BOOKS

Developing Around Transit: Strategies and Solutions That Work. Washington, DC: Urban Land Institute, 2004; with R. Dunphy, F. Dock, M. McAvery, D. Porter, and C. Swenson.
The Transit Metropolis: A Global Inquiry. Washington, DC: Island Press, 1998; translated into Chinese, China Architecture and Building Press, 2007.
Paratransit in America: Redefining Mass Transportation. Westport, CT: Praeger, 1997.
Transit Villages in the 21st Century. New York: McGraw-Hill, 1997; with M. Bernick.
America's Suburban Centers: The Land Use-Transportation Link. Boston: Unwin-Hyman, 1989.
Suburban Gridlock. New Brunswick, New Jersey: Center for Urban Policy Research, Rutgers University

Press, 1986.

RECENT JOURNAL ARTICLES (2010-2011)

- Cost of a Ride: The Effects of Densities on Fixed-Guideway Transit Ridership and Costs. *Journal of the American Planning Association*, Vol. 77, No. 3, 2011, pp. 27-290; with E. Guerra.
- Driving CO₂ Reduction by Integrating Transport and Urban Design Strategies. *Cities*, Vol. 28, No. 5, 2011, pp. 394-405; with R. Tiwari and L. Schipper.
- Green TODs: Marrying Transit-Oriented Development and Green Urbanism. *International Journal of Sustainable Development & World Ecology*, Vol. 18, No. 3, 2011, pp. 210-218; with C. Sullivan.
- To T or Not to T: A Ballpark Assessment of the Costs and Benefits of Urban Rail Transportation. *Public Works Management & Policy*, Vol. 16, No. 2, 2011, pp. 111-128; with E. Guerra.
- Traffic Generated by Mixed-Use Developments - A Six-Region Study Using Consistent Built Environmental Measures. *Journal of Urban Planning and Development*, Vol. 137, No. 3, 2011, pp. 248-261; with R. Ewing, M. Greenwald, M. Zhang, J. Walters, M. Feldman, L. Frank, and J. Thomas.
- The Transition from Welfare-to-Work: How Cars and Human Capital Facilitate Employment for Welfare Recipients. *Applied Geography*, Vol. 31, 2010, pp. 353-363; with J. Sandoval and J. Landis.
- Bus Rapid Transit Impacts on Land Uses and Land Values in Seoul, Korea. *Transport Policy*, Vol. 18, pp. 102-116, 2011; with C. Kang.
- Effects of Residential Relocation on Household and Commuting Expenditures in Shanghai, China. *International Journal of Urban and Regional Research*, Vol. 34, No. 4, 2010, pp. 762-788; with J. Day.
- Are Suburban TODs Over-parked? *Journal of Public Transportation*, Vol. 13, No. 2, 2010, pp. 47-70; with A. Adkins and C. Sullivan.
- Direct Ridership Model of Bus Rapid Transit in Los Angeles County. *Transportation Research Record*, No. 2145, 2010, pp. 1-7; with J. Murakami and M. Miller.
- Travel and the Built Environment: A Meta-Analysis. *Journal of the American Planning Association*, Vol. 76, No. 3, 2010, pp. 265-294; with R. Ewing.
- Transit Transformations. In: *Physical Infrastructure Development: Balancing the Growth, Equity and Environmental Imperatives*, W. Ascher and C. Krupp, eds. Chapter 6. New York, Palgrave Macmillan, 2010.
- Urban Reclamation and Regeneration in Seoul, South Korea. In: *Physical Infrastructure Development: Balancing the Growth, Equity and Environmental Imperatives*, W. Ascher and C. Krupp, eds. Chapter 7. New York, Palgrave Macmillan, 2010.
- Effects of Built Environments on Vehicle Miles Traveled: Evidence from 370 U.S. Metropolitan Areas. *Environment and Planning A*, Vol. 42, 2010, pp. 400-418; with J. Murakami.

CURRENT ADVISING, CONSULTING, AND RESEARCH PROJECTS

- World Bank, Finance, Economics and Urban Department, Study on “Integrated Spatial Development: Towards Integration of Transportation and Land Development in Growing Cities in Developing Regions”; consultant.
- Resource Systems Group, Study on “The Effect of Smart Growth Policies on Travel Demand”, SHRP 2 C16 project; consultant.
- United Nations Habitat, Principal author of the “Global report on Human Settlements 2013: Sustainable Urban Transport”, Nairobi, Kenya.
- Volvo Center for Future Urban Transportation, UC Berkeley, Research on “Implementing BRT for Sustainability, Livability, and Economic Competitiveness.
- Transit Cooperative Research Program, TCRP H-42, “An Exploration of Fixed-Guideway Transit Criteria Revisited, Institute of Urban and Regional Development, UC Berkeley; with D. Chatman.

DR. KAREN TRAPENBERG FRICK, CENTER ASSISTANT DIRECTOR
Lecturer, Department of City and Regional Planning
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EDUCATION

Ph.D., City and Regional Planning, University of California, Berkeley, 2005.
M.A., Urban Planning with a Transportation Emphasis, University of California, Los Angeles, 1992.
B.A., Sociology, University of California, Los Angeles, 1990.

UNIVERSITY-RELATED POSITIONS

UCTC Assistant Director, 2007 to present: Assist the UCTC Director in all aspects of the University of California Transportation Center, which includes the following: (1) manage and participate in the Center's technical transfer/assistance program, which includes research projects requested by public agencies and officials, outreach and dissemination of research results, and management tasks related to the center's key conferences and supervision of graduate and undergraduate student researchers, (2) develop transportation educational programs in coordination with UCTC-affiliated faculty, (3) assist with the review of UCTC's peer-reviewed grant faculty and dissertation grant programs, (4) co-author to inputs required for federal and state required materials, including the UCTC annual report, and (5) liaison to UCTC Executive Committee of UC faculty and UCTC Advisory Committee of practitioners.

Co-Lead Researcher on Independent Evaluation of Congestion Pricing, 2010 to present: conducting study on impacts of congestion pricing on the San Francisco-Oakland Bay Bridge with UC Berkeley research team at request of the Metropolitan Transportation Commission/Bay Area Toll Authority.

Policy and Behavioral Research Leader at California PATH, 2007 to 2009: Oversaw policy research program, which includes grant management of technology and policy-based projects throughout California. Included reviewing and tracking research reports and deliverables.

TEACHING AT UC BERKELEY

- Doctoral Research Design Methods, Fall 2011.
- Program Director and Instructor for [IN]CITY, intensive six-week sustainability lecture and studio course to 75 mid-career professionals, 2010 and 2011. Client for class projects was the City of Berkeley and the Metropolitan Transportation Commission.
- Graduate Course in Transportation Finance, Fall 2007, 25 students.
- Graduate Transportation Capstone Studio Course as co-instructor, 3 semesters, Fall 2008, Fall 2009, Spring 2010. 15 students per semester.
- Graduate Transportation Policy Course, Fall 2010. Co-Instructor, 45 students.
- Introduction to Transportation Planning and Policy, 5 semesters, Spring 2006 to Spring 2008. Average enrollment of 87 students per semester.

SELECTED PROFESSIONAL EXPERIENCE

- Transportation Planner/Project Manager, Metropolitan Transportation Commission, 1992-2001.
- Project manager for MTC's award-winning Transportation for Livable Communities Program, which funds community-based transportation projects including streetscapes and transit-oriented develop-

ment. Lead staff on program development and implementation. Co-author of a resource guide on community-based transportation strategies. Conducted project selection process for the board's approval of \$46 million in funding to over 100 projects and directly managed 40 contracts.

- Project manager for the initial Bay Bridge congestion pricing project, the nation's first federally funded pricing grant: 1) developed a \$45 million proposed revenue expenditure plan for additional transit/ridesharing services in the corridor; 2) MTC project manager for revealed and stated preference travel surveys of 3,700 households; and, 3) supervised several consultant studies.
- Other key tasks included transit funding project manager and legislative analysis.

U.S. DOT Summer Transportation Program for Diverse Groups, Intern, 1991: Conducted study of market-based pricing strategies and transit demand for at the Federal Transit Administration, Budget and Policy Office, Washington, D.C.

SELECTED PUBLICATIONS

- Transfer of Innovative Policies Between Cities to Promote Sustainability. *Transportation Research Record*, No. 2163, 2010, pp. 89–96; with G. Marsden, E. Deakin, A.D. May.
- Markets for Dynamic Ridesharing? The Case of Berkeley. *Transportation Research Record*, No. 2187, 2010, pp. 131–137; with E. Deakin and K.M. Shively.
- Transport of Today and Tomorrow—How Can Technology and Transport Policy Help Us Steer the Future? *Access*, No. 34, 2009; with E. Deakin and A. Skabardonis.
- The Cost of the Technological Sublime: Daring Ingenuity and the New San Francisco-Oakland Bay Bridge. In: *Decision-making on Megaprojects: Cost-Benefit Analysis, Planning and Innovation*, H. Premius, B. Flyvbjerg, and B. Van Wee, eds. Cheltenham, UK, and Northampton, MA, Edward Elgar, 2008.
- Contracting for Public Transit Services: Evaluating the Tradeoffs. In: *Privatisation and Regulation of Urban Transit Systems*, Proceedings of Transport Research Center Roundtable 141, OEDC, 2008; with B. Taylor and M. Wachs.
- Bay Bridge Congestion Pricing Project: Lessons Learned to Date *Transportation Research Record*, No. 1558, 1996, pp. 29-38; with S. Heminger and H. Dittmar.

AWARDS AND MEMBERSHIPS

- US Department of Transportation Eisenhower Fellowship, full fellowship, 2002-05.
- UCTC Fellowship, received at UCLA and UC Berkeley, 1990-92, 1998-2002.
- UCTC Dissertation Research Grant, 2002-03.
- WTS, Bay Area Chapter graduate student fellowship, 2002.
- Dean's Normative Time Fellowship; University of California Regents Scholarship .
- Magna Cum Laude, and Phi Beta Kappa.
- Member of Women's Transportation Seminar and World Conference on Transport Research Society.

LISA SIMON-PARKER, CENTER FINANCIAL ADMINISTRATOR

Financial Administrator,
University of California Transportation Center
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FINANCIAL ADMINISTRATOR, UCTC

Provides programmatic support to UCTC, primarily in the areas of daily center operations and multi-

campus sub award processing and acts as the primary point of contact for all multi-campus programs, as well as UCB and ITS administration. Reviews, monitors, and controls UCTC multi-campus sub awards supporting faculty research grants, fellowships, dissertation awards, and educational projects. Responsibilities also include sub award tracking, management of pre award, post award, and closeout activities at the programmatic level for federal, state, local, and other sponsors. Develops proposals, contracts, and other agreements on behalf of the program and reviews incoming proposals to ensure institutional compliance. Provides assistance in preparation of grant required financial reports, including review of agency invoices and tracking of sub award expenditures. Also, administrative liaison and main point of contact for sponsoring agencies and participating UC campuses. Office coordinator for HR, payroll, accounting, purchasing, physical plant, and computer resources.

PREVIOUS UC BERKELEY EXPERIENCE

BUDGET ADMINISTRATOR ASSISTANT, SCHOOL OF EDUCATION – BUSINESS SERVICES

Directed post award management of 73 intramural and extramural portfolios of state, federal, contracts and grants, private gifts, endowments, sub awards, and income funds totaling approximately \$15 million. Managed all aspects of sponsor projects and grants including budgets projections, PI communications, and approved expenses, reporting, and closeout procedures. Monitored expenses, transfer funds by financial journal or zero adjustments to proper fund sources. Prepared IOC's for campus services. Generated and processed cash deposits, check requests, travel and entertainment requests, purchase orders, and reimbursements for students, faculty, and staff; determined charges for office services, and charging units through zero adjustments, and reconciled expenditures. Facilitated parking permits, including tracking parking charges on financial reports. Administered and monitored BluCard activities and student work-study balances.

ACCOUNTS PAYABLE REPRESENTATIVE, HOUSING & DINING – BUSINESS SERVICES DIVISION

Analyzed and processed invoices, purchase orders, and check requests. Prepared and reviewed travel and entertainment reimbursements. Posted for review and approved zero adjustments. Researched and advised staff, campus departments, and vendors of past due payment transactions. Provided customer service support to users and resolved vendor problems.

ADMINISTRATIVE ASSISTANT, PARKING & TRANSPORTATION DEPARTMENT

Verified monthly payroll deduction reports for accuracy. Submitted approved payroll deductions. Maintained and produced reports, information requests, and e-mail correspondence. Addressed and handled customer complaints with calmness, professionalism, and courtesy. Researched and submitted payroll refunds. Prepared check balances, daily deposits, and all opening and closing procedures.

ADDITIONAL PROFESSIONAL EXPERIENCE

OFFICE ADMINISTRATOR-FAITH CHRISTIAN ACADEMY, RICHMOND, CA

Analyzed and authorized student health records for admission standards. Controlled student tuition payments and assembled weekly academy deposits. Coordinated and implemented school fundraiser programs and associated outings. Developed and edited student academic yearbooks.

EXECUTIVE ASSISTANT, HUMAN RESOURCES, AND PAYROLL ADMINISTRATOR-FIRST AMERICAN TITLE LENDERS ADVANTAGE, CONCORD, CA

Managed and distributed monthly expense reports to executive management. Prepared and processed timesheets for payroll purposes. Compiled and distributed payroll checks. Maintained and tracked salary reviews, promotions, title changes, vacation accrual, usage, personnel issues, sick, personal, and medical leaves. Managed and revised employee personnel database. Created and distributed monthly newsletters. Conducted and coordinated monthly new employees benefits orientation classes. Organized and provided

monthly question & answer sessions to newly hired employees. Assisted and consulted employees with benefits questions, policies, and procedures regarding COBRA, workman compensation, and disability insurances. Prepared offer letters; dictated and composed miscellaneous correspondence and coordinated travel arrangements for Regional Vice President.

EXECUTIVE SALES & MARKETING, AND OFFICE MANAGER-CYRA TECHNOLOGIES, OAKLAND, CA

Arranged logistics for meetings, seminars, tradeshows, and social engagements to include catering, guest speaker arrangements, shipping, and facility set up. Managed and coordinated complex travel arrangements, calendaring, and scheduling for sales, marketing, service teams, and VIP clientele. Ordered and maintained marketing materials for seminars, conferences, dealers, marketing, and sales teams. Tracked marketing leads with correspondence letters and/or product literature packets. Organized and compiled marketing magazine editorials. Managed and supervised marketing's prospective leads and customer/client databases. Approved and verified departmental expenses and invoices. Created and maintained company phone directory listings. Reconciled and reviewed shipping and vendor billings. Managed all building maintenance and facility work orders.