

DIVISION OF RESEARCH, INNOVATION & SYSTEM INFORMATION
Research Initial Scope of Work
SUBMITTAL FORM - FY 18/19

I. Project Number: P1309

Project Title: Parking Utilization and Site Level VMT Database

II. Task Number: 3291

Task Title: Parking Utilization and Site Level VMT Database

III. Project Problem Statement:

Parking requirements are widely thought to be one of the most powerful tools available to city planners to influence travel behavior. While previous research has provided some evidence that building more parking leads to greater vehicle miles of travel (VMT), practitioners do not have sufficient information to quantify the extent of that relationship and understand how it may vary with different projects in different locations and land use contexts. This lack of critical information hinders practitioners' ability to develop appropriate parking requirements. This study would put Caltrans at the forefront of this critical research topic, and would empower planners in California with the data needed to design policy to meet state and local VMT reduction goals.

IV. Objective:

The study aims to establish the empirical relationship between building site-level parking supply and vehicle miles traveled (VMT) to support the development of policies that promote access, and improves parking management, while reducing VMT. Additionally, this task is to provide four cities with a tool that can estimate the changes to VMT that accounts for the amount of parking at a site level. Therefore, the task will provide communities an opportunity to reduce injuries and fatalities as well as indirect health effects from mobile sources (e.g. emissions) by employing site-level measures (e.g. parking controls) that reduce VMT: the goal is to create an open database of the number of parking spaces available in an area, and the amount of parking spaces used. This research enhances Caltrans ability to determine whether and how to comment on parking for a particular local development project or General Plan.

V. Task Description of Work and Expected Deliverables:

The study would develop a statewide parking database that captures parking supply, parking utilization, site characteristics, such as number of housing units and square feet of commercial space, and travel behavior across different land use 'place types' found throughout the state. The database may also include area characteristics such as regional context, land use mix, density, transit service, and accessibility. The study will also develop a model to estimate VMT for a site, using the site, area, regional context, parking supply and utilization data. Controlling for these factors that affect VMT will allow the researchers to establish a relationship between parking and VMT.

The study should include the following tasks:

1. Analysis Goals

The purpose of this task is to identify the required sensitivities of the model - what attributes of parking supply and utilization should the model be sensitive to, what site-level, area level, regional context, demographic, or other factors that may influence VMT should be controlled for, such as the characteristics of trips using ride-hailing apps. This task should identify the desired inputs and outputs of the model.

Deliverable:

Parking/VMT Analysis Model performance requirements memo

The memo will document desired inputs, outputs, and model sensitivities of the Parking/VMT Analysis Model.

2. Analysis Methodology

The purpose of this task is to research the specific analysis methods, formulations, and associated data needed to support development of a model with the sensitivities identified in Task 1. This task will involve identifying a variety of analytic approaches and identifying their alignment with desired model sensitivities, data collection needs, associated time and cost of data processing. For each proposed analysis method, this task should identify the specific data items that are needed. This should include any parking supply and utilization data; site-specific data such as number of housing units and square feet of commercial space; area-level land use and transportation characteristics such as land use density, land use mix, transit service, accessibility to jobs by mode; demographic data; or other data identified in Task 1. It should also identify the travel behavior data which will be the source of observed VMT.* Finally, a preferred analytic approach will be identified.

Deliverables:

Parking/VMT Model Alternatives Memo

This memo will identify alternative model formulations along with the time, costs, and risks associated with each. The memo will provide detailed data collection plans, including specific data items to be collected, data sources, data cleaning and processing considerations, and risks regarding ongoing access to data. It will include estimated total costs for model development of each alternative. After identifying trade-offs between alternative model formulations, the memo will identify a recommended alternative.

*The preferred method for collecting travel behavior data is through app-based household travel surveys because this method allows robust calculation of VMT, is compatible with other planned data collection efforts, and allows the analyst to

control for the relationship between the demographic characteristics and travel behavior.

3. Data Collection Plan

This task will identify how sites will be selected for data collection, how data should be collected, and estimate associated time and cost. The site selection criteria shall be informed by the need to develop a robust database to serve representative land use and travel behavior contexts of jurisdictions across the state. The Data Collection Plan should identify the number of sites in each of the four cities. Finally, based on estimated costs and budget, this task should identify data collection sites.

Deliverables:

Data Collection Memo

This memo will document the data items to be collected, site selection criteria and methodology, data collection methodology, and estimated time and cost for site-level data collection.

Site Selection Memo

This memo will document the sites that were selected using the methodology described in the Data Collection Memo.

4. Database Design and Maintenance Plan

The purposes of this task are to identify a database schema and software and propose a maintenance plan. The database schema should accommodate all of the data items identified in Task 2, and should be flexible enough to incorporate future site level VMT areas of research. The database is expected to incorporate other factors that affect VMT at a site level, such as pedestrian environmental factors and transit accessibility. The database software should consider usability (how user-friendly), manageability (how easy is it to host, update, and modify), and accessibility (how easily can users in different physical locations gain access to the data). The maintenance plan should identify what party is responsible for hosting the database, what party or parties are responsible updating or adding data. It should also identify the process by which new records (rows) are added, and new fields (columns) are added. This task should identify expected direct costs and staff time requirements associated with hosting, maintenance, and updates.

Deliverables:

Database Design and Maintenance Plan Memo

The memo should document the database design, including the schema and what software the database will be implemented in. The memo should also document roles, responsibilities, and ongoing costs associated with hosting, maintaining, and updating the database.

5. Database Development, Data Collection, Processing, and Storage

The purpose of this task is to create the database described in the Task 3 Database Design and Maintenance Plan Memo and carry out the data collection plan identified in the Data Collection Memo at the sites identified in the Site Selection Memo prepared in Task 2. This task includes data collection, any data processing necessary to derive the identified data items, and loading the data into the database.

Deliverables:

Populated Parking/VMT Database

This database should fit the schema identified in Task 3 and contain data items collected at locations described in Task 2.

6. Model Implementation

The purpose of this task is to implement the preferred model identified in the Task 1 Parking/VMT Model Alternatives Memo, using the database developed in Task 5. This task involves estimating and calibrating the model and validating its performance against empirical travel data sources.

Deliverables:

Parking/VMT Model

This tool will estimate an empirical relationship between parking supply and VMT at a site level, using any other control variables identified in Task 2.

Parking/VMT Model Assessment Memo

This memo will document the Parking/VMT model. It will include a description of how the model is implemented and what data were used. It will assess the performance of the model, including validation statistics. Finally, it will provide an assessment of the replicability of the model, including ongoing data analysis; data preparation; and using, updating, and expanding the model.

VI. Background:

The potential applicability of the Parking/VMT database and model is far-reaching. The database and model will provide a uniform platform for government agencies, land use and transportation planners, and environmental professionals to estimate VMT. The results will provide the analytical framework to support cities efforts to evaluate travel demand management (TDM) strategies and inform TDM regulations and developer requirements.

As an appendix to the General Plan Guidelines, the California Governor's Office for Planning and Research published a Senate Bill 743 Technical Advisory on transportation safety. Within that document, the office conducted a literature review

about different transportation aspects that affect safety. The office quotes one study that summarizes the fundamental relationship between vehicle miles traveled and safety (Yeo et. al, 2014):

“Multiple traffic safety studies showed that higher VMT was positively associated with the occurrence of traffic crashes or fatalities (e.g., Ewing et a. 2002, 2003: NHTSA 2011). The causal relationship between the mileage of total vehicle trips and crash occurrences can be explained by probability. With higher VMT, it is more likely that more crashes will occur (Jane et al. 2012).”

More driving is also linked to more local, regional, and global emissions. New technologies for direct sources of emissions can achieve only so much in reducing emissions. As acknowledged in the federal Clean Air Act, indirect sources, such as parking, attract mobile sources of emissions.

For their Transportation Demand Management Program, San Francisco conducted a literature review about the relationship between parking and VMT. As stated within their Transportation Demand Management, Technical Justification (June 2016, updated January 22, 2018), “more off-street parking is linked to more driving and people without dedicated parking spaces are less likely to drive” (pages 32 and 33). Despite this literature, travel demand tools are based on limited studies and/or not sensitive to estimate VMT using site-level characteristics (e.g, the amount of parking provided for a development).

Thus, a purpose of this task is to provide communities with a tool that can estimate the changes to VMT that accounts for the amount of parking at a site level and provide communities an opportunity to reduce injuries and fatalities and indirect health effects from mobile sources (e.g. emissions) by employing site-level measures (e.g, parking controls) that reduce VMT.

Caltrans’ LD-IGR (Local Development – Intergovernmental Review) program often references parking reduction in our formal comment letters as an appropriate Transportation Demand Management (TDM) measure to support infill development. The program relies on prior statewide and nationwide research that documents how lack of parking can be a primary decision point to make a trip via transit, rail, bicycle, or pedestrian modes, rather than an automobile. Local jurisdictions such as cities use parking research to make policy decisions about minimum and/or maximum parking requirements, and provision of on-street and off-street parking in neighborhoods and around destination centers (central business district, arena, tourist attraction, etc.) The study would contribute to a statewide parking database that captures both travel behavior and parking utilization across different land use ‘place types’ found throughout the state. These results will also provide the analytical framework to support cities efforts to adopt transportation demand management (TDM) regulations, and substantiate a sufficient nexus to require developer contributions to build infrastructure that increases site access by non-single occupancy vehicle (SOV) travelers from developers that elect to provide on-site parking that is above regulatory requirements.

VII. Estimate of Duration:

2 years (FY 18/19 – 20/21)

VIII. Related Research:

Task 2872: UTC - SB-743: From LOS to VMT, VHT and Beyond Through Data Fusion: Application to Integrated Corridor Management, (UCCONNECT)

The main result from the proposed work will be an assessment of the usability of novel data types to support the objectives of SB-743, in particular the computation of VMT and VHT on the arterial network to enable corridor management. In addition, the work will propose a theoretical and algorithmic methodology to make use of whatever data is available on the corridors to provide "the best" computations of these metrics "based on available data." The project will produce open source code directly available to the research community and public agencies

Task 2886: UTC - Shifting from LOS to VMT as the Measure of Transportation Impacts: Evaluating Prospects for Implementing Senate Bill 743, (UCCONNECT)

Using a case study approach, this research will consist of two parts. The first will evaluate tools-in-use for estimating VMT impacts of development projects, considering outputs in connection to the best available research on the subject, and also against the proposed state rules for determining significant effects that require mitigation. The second component will consist of interviews with local CEQA practitioners and assessment of pertinent documents on CEQA review, to identify challenges for implementing SB 743 at the local level. The research will identify effective VMT assessment techniques that state policymakers may want to recommend to local agencies.

San Francisco's adopted Transportation Demand Management Program relied heavily on literature review related to the relationship between parking supply and vehicle miles traveled. A summary of that research is found in its TDM Technical Justification document. In particular, Chapter 4 discusses literature review and research in San Francisco. San Francisco also used the referenced research in CEQA documents and in policy discussions about parking.

<http://sf-planning.org/shift-transportation-demand-management-tdm>

<http://sf-planning.org/tdm-materials-and-resources> (see TDM Technical Justification document, Chapter 4, particular pages 22, 32-33; also see Technical Background Studies from Fehr & Peers).

IX. Deployment Potential:

In essence, the study's deployable products are:

- a statewide parking database to support policies promoting access, improving parking management, and reducing VMT.
- a model to estimate VMT for a local development site, using the site, area, available parking supply and utilization data and travel demand model. Controlling for these factors that affect VMT will allow the researchers to establish a relationship between parking and VMT.

X. Date: May 2, 2018