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MTI MINETA TRANSPORTATION INSTITUTE

# Geospatial Information Tools in the Service of Mobility and Transportation

Thomas O'Brien, PhD
Tyler Reeb, PhD
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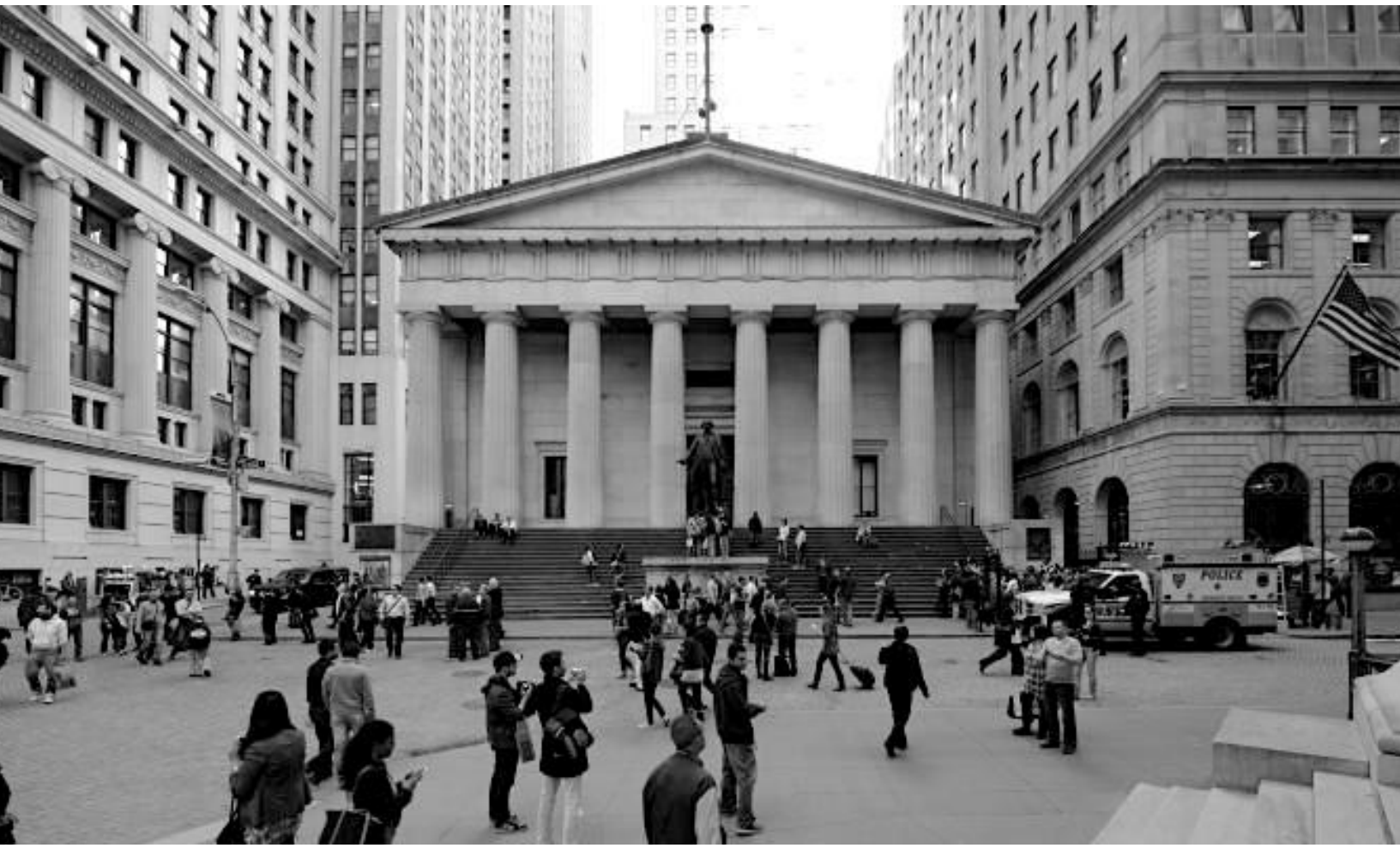

CSUTC California State University Transportation Consortium

CALIFORNIA STATE UNIVERSITY LONG BEACH

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Founded in 1991, the Mineta Transportation Institute (MTI), an organized research and training unit in partnership with the Lucas College and Graduate School of Business at San José State University (SJSU), increases mobility for all by improving the safety, efficiency, accessibility, and convenience of our nation's transportation system. Through research, education, workforce development, and technology transfer, we help create a connected world. MTI leads the four-university California State University Transportation Consortium (CSUTC), which also includes California State University, Chico; Fresno State University; and California State University, Long Beach, and is funded by the State of California through Senate Bill 1.

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## Research

MTI works to provide policy-oriented research for all levels of government and the private sector to foster the development of optimum surface transportation systems. Research areas include: bicycle and pedestrian issues; financing public and private sector transportation improvements; intermodal connectivity and integration; safety and security of transportation systems; sustainability of transportation systems; transportation / land use / environment; and transportation planning and policy development. Certified Research Associates conduct the research. Certification requires an advanced degree, generally a PhD, a record of academic publications, and professional references. Research projects culminate in a peer-reviewed publication, available on TransWeb, the MTI website (http://transweb.sjsu.edu).

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REPORT 19-06

# GEOSPATIAL INFORMATION TOOLS IN THE SERVICE OF MOBILITY AND TRANSPORTATION

Thomas O'Brien, PhD
Tyler Reeb, PhD
Benjamin Olson

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**16. Abstract**

The Center for International Trade and Transportation (CITT) research team developed a survey-based digital walk audit tool, referred to as the digital community-source audit (DCSA), that urban and transportation planners can use to assess transportation systems at a given site. The DCSA provides a means of gathering data in a more dynamic way with an eye toward developing richer and more accurate data models to optimize trade and commute corridors. The DCSA gathers users' locations when collecting data, and thus the output is a spatial dataset, available for geospatial analysis using GIS software. Survey questions from a paper walk audit checklist used by LA Metro were adopted for use in the DCSA. Testing and feedback from focus groups comprised of transportation consulting professionals, public sector employees, and urban planning students determined the DSCA will improve planning work by enabling the visualization of potential passenger-freight conflicts when planning new developments.

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# EXECUTIVE SUMMARY

Addressing Objectives 4 and 8 of the California State University Transportation Consortium (CSUTC) Transportation Research & Training (TRANSPORT) Request for Proposals, the Center for International Trade and Transportation (CITT) developed, tested, and deployed a mobile phone-based digital data collection tool for use by transportation planners and policymakers. Objective 4 aims to "create safer communities, increased access to transit, and greater opportunities for use of active transportation modes (i.e., biking and walking) through complete streets and innovative land use planning, so that people of all abilities and socioeconomic levels can enjoy the same opportunities for learning, living, labor, and leisure." Objective 8 seeks to "optimize passenger and freight movements to improve mobility of people and goods through development of more accurate data models and advanced congestion management tools to achieve trade and commute corridor improvements."[1]

The collection tool was based on a paper walk audit checklist used by transportation planners at LA Metro to perform site assessments. In the digital version developed for this project, transportation planners and policymakers are provided with a means of gathering data in a more dynamic way with an eye toward developing richer and more accurate data models to optimize trade and commute corridors. This is particularly the case with the last mile, where conflicts between various modes of transport are increasingly acute. By identifying new ways to document and understand the multiple demands for use for any given space (for example, freight deliveries, ride share companies, scooters, and pedestrians) urban planners can mitigate their impacts. By observing and gathering data in communities on the use of transportation systems and related infrastructure, the digital walk audit becomes a tool to promote safety and create more equitable access to mobility options for all socioeconomic levels.

The tool, referred to throughout this report as the digital community-source audit (DCSA), takes the form of web-based surveys that gather information on transportation features around a given area of study. Users of the DCSA conduct a physical on-site walk audit as they would with a paper and pen, but the DCSA allows for a central repository of multiple users' data. The data is also in digital format which allows for improved data storage and analysis. The collected data also has a geospatial component that allows for later spatial visualization and analysis of the information gathered by users.

Testing and focus groups consisting of transportation consulting professionals, public sector employees, and urban planning students provided a needs assessment and feedback on the DCSA. Feedback consensus determined that the tool will improve planning work by allowing urban planners to visualize potential passenger-freight conflicts when planning new developments. Iterative feedback on the DCSA via testing and focus groups has allowed for continued augmentation of usability throughout the development process. The resulting product has robust functionality, capturing both date and time for each data point, and includes photo attachments and logical question toggling. Testing and feedback also improved question clarity. The DCSA has been used in classes offered by CITT and will be incorporated into other academic and professional development settings.

# I. INTRODUCTION

The CITT team (Thomas O'Brien, PhD, Tyler Reeb, PhD, and a cohort of graduate research assistants led by Benjamin Olson) has developed a digital walk audit tool, or digital community-source audit (DCSA), for data collection that uses Geospatial Information Systems (GIS) technology to empower transportation planners and policymakers to better understand the relationship between freight and passenger transport within urban mobility systems. Equipping planners and policymakers with the DCSA will enable them to better analyze their observations when making decisions about new urban developments. They can then in turn better communicate their decisions to a diverse audience of stakeholders including the residential and business communities impacted by the planning process and new project approvals. The DCSA was designed specifically for transportation planners, engineers, policy consultants, and economic developers who work with California-based transportation agencies, providers, and operators including the Los Angeles County Metropolitan Transportation Authority (LA Metro), the Southern California Association of Governments (SCAG), the California Department of Transportation (Caltrans), and municipal agencies.

Survey123 by Esri was chosen as the platform on which to build the DCSA because of its ability to integrate with GIS software as well as its user-friendliness and customizability. A licensed Esri account is necessary to create surveys using Survey123; this was freely available to the researchers via licensing provided by Esri for educational purposes.

While many government agencies have Esri licenses, broad-based use of the tool, particularly by community groups as part of community planning exercises, has been limited by this requirement. In response, the project team explored alternative platforms using the same basic survey architecture. EpiCollect is a survey builder that came out of research done by David M. Aanensen, Derek M. Huntley, Edward J. Feil, Fada'a al-Own, and Brian G. Spatt.[4] It is funded by Wellcome Trust, a charitable foundation based out of the United Kingdom. The interface and functionality of EpiCollect is largely analogous to Survey123. However, downloading a spatial dataset of the survey responses is less straightforward than with Survey123, given that Survey123 integrates with the Esri platform seamlessly. Regardless, EpiCollect provides an opportunity to expand the reach of the DCSA through an open source platform.

This project began by conducting a needs assessment for the tool at a pilot course on freight planning that CITT conducted for transportation consultants in 2017. Survey123 was selected after exploring different development platforms. Design and iterative testing and feedback on functionality and usability then followed. Finally, a deployment plan was constructed to see how the tool could have broader uses.

# II. METHODOLOGY

The DCSA is web-based and accessible via any mobile device. The DCSA was developed using Esri's 'Survey123'—a "complete, form-centric solution for creating, sharing, and analyzing surveys."[2] Survey123 also has the ability to geo-locate data when collecting in the field, as well as other functionality that enhances data collected for transportation planning, with a user-friendly interface.

The DCSA was developed within the context of preparation for an innovative pilot course funded by the Volvo Research and Education Foundations that took place during January and February 2019. The participants included public and private sector employees in planning-related industries in the greater Los Angeles region.

The course, titled "The Battle for the Curb: Managing Local Goods Movement in the Age of E-Commerce," was coordinated jointly by the South Bay Cities Council of Governments and METRANS Transportation Center, a joint partnership between CITT at Long Beach State University (LBSU) and the University of Southern California (USC). The course informed participants on approaches to transportation planning related to last-mile freight deliveries in urban settings where there is a "battle" for curb space between bikes, ride-sharing vehicles, public transit, etc. The course also provided an opportunity for the CITT team to refine the DCSA.

## NEEDS ASSESSMENT

The need for a digital walk audit data collection tool was assessed at a 2017 course developed in partnership with METRANS, which convened transportation planners from the LA Metro, Caltrans, and the office of Los Angeles City Councilman Joe Buscaino. Officially called the Metropolitan Transportation Management Certificate (MTMC) pilot course, sessions took place over four consecutive Fridays in February and March of 2017 and informed participants on multi-modal transportation conflicts in urban areas. During a walk audit of a case-study area in West Los Angeles, participants in the course used a combination of paper audits and a beta version of the DCSA to gather data regarding potential passenger-freight conflicts.

Course participants expressed support for the data collection tool concept and how it made the walk audit more data-driven and geospatially comprehensive. They did, however, raise a number of usability issues and noted that the collection tool and related walk audit methods would need to be refined and adjusted for transportation professionals who are not in-house staffers for transportation organizations.

To further assess the workforce's need for a digital walk audit tool and to collect feedback on the DCSA, two focus groups were held. First, CITT coordinated a group of Urban Planning, Development, and Health Administration graduate students from the University of Southern California to test and provide feedback on the tool at a site in Torrance, California that was being planned for redevelopment. The second group consisted of "Battle for the Curb" participants. The course used the same site in Torrance as the location for testing the tool. The course exercise involved using the DCSA to gather data on possible planning issues and modal conflicts which in turn could be hypothetically incorporated into a Request for Proposals for a planning and development consultant for the site.

In addition to focus groups, feedback on the DCSA was gathered in individual consultations with Esri, LA Metro, and members of an advisory group established by CITT for a GIS-based transportation class developed for Los Angeles Trade Technical College.


**Figure 1. "Battle for the Curb," Session One**

**Battle for the Curb Course Outline**

| | | |
|---|---|---|
| **Jan 24** | 2:00pm – 3:30pm | Introduction and Overview<br>• State of the Supply Chain: The Changing Geography and Economics of Logistics and Supply Chain Management<br>  ○ Freight Trends<br>  ○ Focus on e-commerce impacts on last mile<br>• Urban Freight Dynamics: The Battle for the Curb<br>• The Role of Freight Planning at the Municipal Level (the planning perspective)<br>• Tools to Respond to Last Mile Challenges<br>  ○ Last Mile/First Mile Strategies<br>  ○ Innovative Practices: Best Urban Freight Solutions (BEST UFS) from home and abroad |
| | 3:30pm – 3:40pm | *Break* |
| | 3:40pm – 4:25pm | Overview of Former Toyota Headquarters Site<br>• Sue Dexter, former Toyota employee and Urban Planning and Development Ph.D. student at University of Southern California |
| | 4:25pm – 4:45pm | Demonstration of Data Collection Application<br>• GIS Tools in Transportation/Freight Planning: Data Management, Modeling, and Visualization |
| | 4:45pm – 5:00pm | Project Introduction<br>• Proposal for economic development at the former Toyota HQ<br>• Teams of two assigned to fill out Google Form introducing their thoughts for the project |
| | Homework | • Submit initial presentation ideas |
| **Jan 31** | 2:00pm – 2:55pm | Presentation from City of Torrance Economic Development |
| | 2:55pm – 3:05pm | *Break* |
| | 3:05pm – 4:15pm | Digital Walk Audit – Data Collection at Former Toyota HQ |
| | 4:15pm – 5:00pm | Debrief Walk Audit and Work on Projects |
| | Homework | • Participants receive collected data to use in their presentations |
| **Feb 7** | 2:00pm – 2:15pm | Introduction of Urban Freight Mentors |
| | 2:15pm – 2:45pm | Wrap up Presentations |
| | 2:45pm – 2:55pm | *Break* |
| | 2:55pm – 4:15pm | Project Presentations |
| | 4:15pm – 4:45pm | Mentor Response |
| | 4:45pm – 5:00pm | Awarding of Certificates |

**Figure 2. Curriculum Outline for the Three-Day "Battle for the Curb" Course**

**Figure 3. A Weathered Sign: An Example of a Data Point Captured by the DCSA**


**Figure 4. Testing of the Tool at the Vacant Toyota Site in Torrance, CA**

## APPLICATION DESIGN

The survey questions used in the DCSA were determined prior to the MTMC pilot course. An existing LA Metro Walk Audit (see Appendix) was referenced to create a set of questions that was condensed and modified to be appropriate for the DCSA.[3]

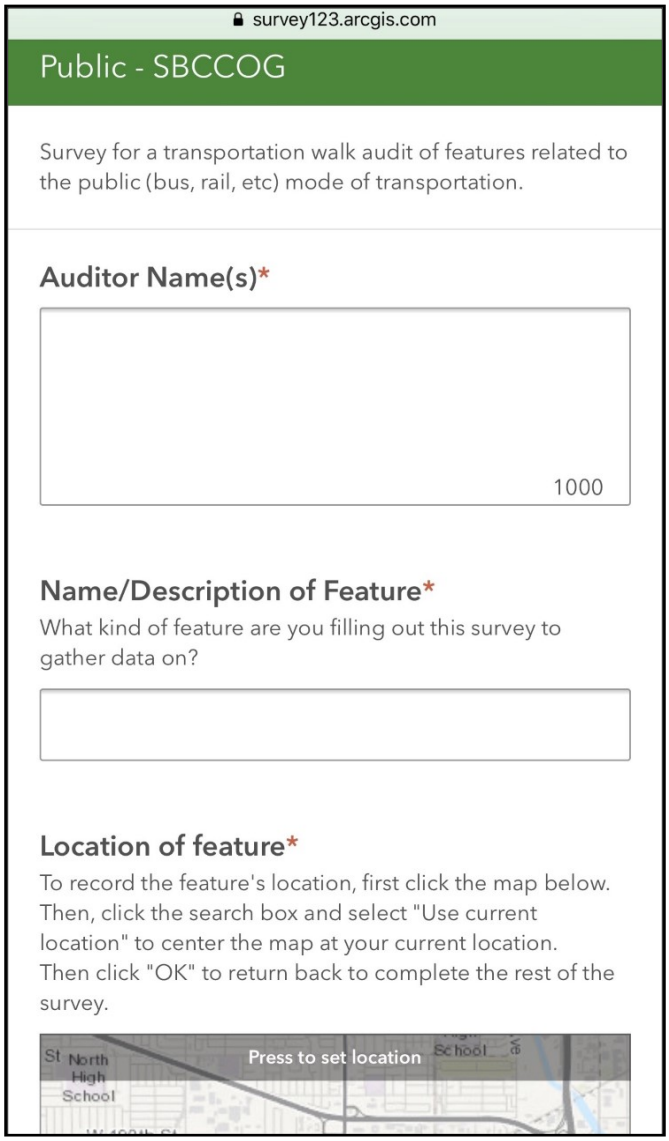


**Figure 5. First Part of the Public Transit Survey as It Renders on a Mobile Device**

Survey123 allows users to create customizable surveys that can take advantage of a variety of question modes, which include: multiple choice; single-line text; multi-line text; image attachment; and GeoPoint. The survey creator also allows for questions to be toggled; this is dependent on a user's response to a prior question. For example, if a user answers "Yes" to "Do any design elements of the feature impede truck movement?" then the prompt "Explain the design element and corresponding impedance" is the next question in the survey. Otherwise, the prompt is not pertinent and is therefore omitted.

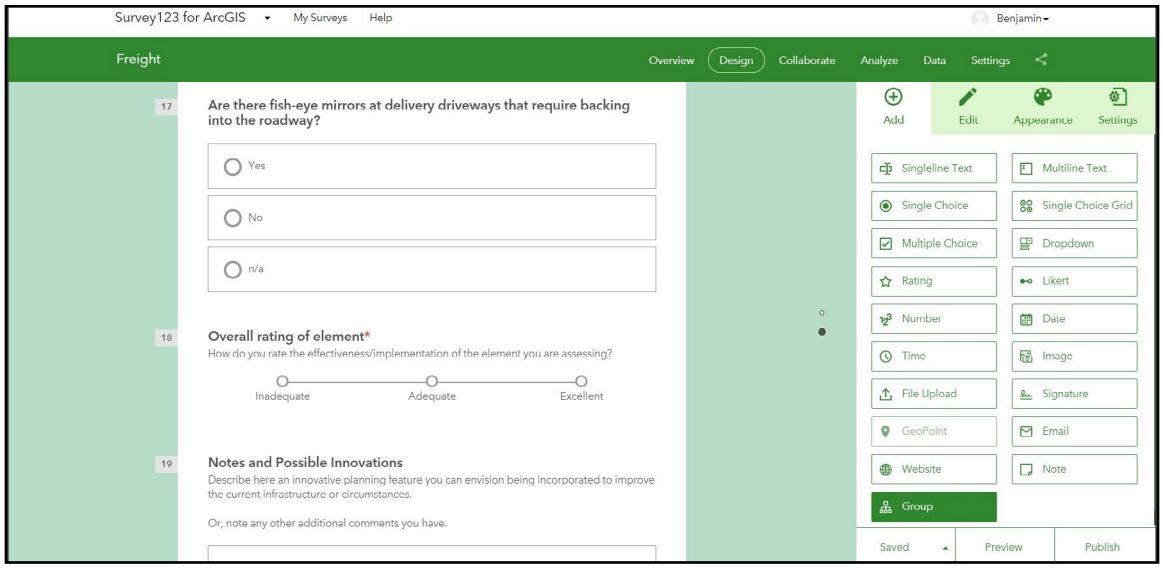


**Figure 6. Web Browser Interface for Survey123's Survey Creator**

One survey was created for each of the active, public, personal vehicle, and freight modes of transportation. This was made necessary by the fact that questions differed greatly depending on the mode being assessed. Certain survey questions were applicable to all four modes and were thus present in all four surveys. Table 1 contains the questions from all four surveys.

**Table 1. Comprehensive List of Survey Questions**

| Question | Survey | Question mode |
|---|---|---|
| Auditor Name(s) | All | Multiline text |
| Name/Description of Feature | All | Singleline Text |
| Location of feature (geolocated) | All | GeoPoint |
| Date | All | Date |
| Time | All | Time |
| Photo of the feature | All | Image attachment |
| Specify if this feature causes conflict with any other mode(s) of transportation | All | Multiple Choice |
| If applicable, what is/are the conflict(s)? | All | Multiline text |
| Overall rating of the element | All | Likert (scale) |
| Notes and Possible Innovations | All | Multiline text |
| Are driveways accessible for freight/delivery trucks? | Freight | Single Choice |
| Is truck signage clearly visible? | Freight | Single Choice |
| Are loading zones visible/clearly marked? | Freight | Single Choice |
| Is there adequate curb space for curbside loading and unloading? | Freight | Single Choice |
| Are there residential areas that are adversely affected by freight delivery trucks? | Freight | Single Choice |
| Do any design elements of the feature impede truck movement? | Freight | Single Choice |
| Is the turn queue length adequate for truck turns? | Freight | Single Choice |
| Are driveway entrances/exits wide enough for truck turns? | Freight | Single Choice |

| Question | Survey | Question mode |
|---|---|---|
| Is there evidence of trucks breaking curbs or driving off of pavement at entrances? | Freight | Single Choice |
| Are there fish-eye mirrors at delivery driveways that require backing into the roadway? | Freight | Single Choice |
| Is the waiting area sufficient to accommodate pedestrians? | Public | Single Choice |
| Are the crosswalks well-marked? | Public | Single Choice |
| Are there sidewalks present around the feature? | Public | Single Choice |
| Are there hazards resulting from maintenance issues? | Public | Single Choice |
| Do you feel safe waiting for transit in this area during this time of day? | Public | Single Choice |
| Are there crosswalks present? | Active | Single Choice |
| *Are the markings wide enough?* | Active | Single Choice |
| *Are the markings clearly visible?* | Active | Single Choice |
| *Are audible pedestrian signals available?* | Active | Single Choice |
| Are pedestrian signs clearly visible? | Active | Single Choice |
| Are bicycle lanes present? | Active | Single Choice |
| *Are bicycle lanes clearly marked?* | Active | Single Choice |
| *Are bicycle lanes present on right-turn lanes?* | Active | Single Choice |
| Are there sidewalks present around the feature? | Active | Single Choice |
| *Do the sidewalks have proper lighting?* | Active | Single Choice |
| *Are the sidewalks around the study area wide enough for pedestrians using mobility devices (wheelchairs, scooters, walkers, etc)?* | Active | Single Choice |
| *Do construction sites in/around the study area obstruct sidewalks?* | Active | Single Choice |
| Are there hazards resulting from maintenance issues? | Active | Single Choice |
| Are there any permanent obstructions that reduce usable path width below minimum standards? | Active | Single Choice |
| Are curb ramps easily accessible on all intersection crossings? | Active | Single Choice |
| Are the waiting areas leveled with sufficient maneuvering space to accommodate wheel chairs? | Active | Single Choice |
| Are trees trimmed to allow clear views of approaching traffic? | Vehicle | Single Choice |
| Are vehicle speed-limit signs well-lit and clearly visible? | Vehicle | Single Choice |
| Are all other street signs well-lit and clearly visible? | Vehicle | Single Choice |
| Are speed bumps present to promote safety and mobility? | Vehicle | Single Choice |
| *Explain the design element and corresponding impedance.*[1] | *Freight* | *Multiline Text* |

Once completed, each survey was published and made accessible on Esri's ArcGIS Online platform.The vehicle mode was then built and tested internally at CITT. Clarity issues that arose from users accessing the survey from different platforms (e.g. Android vs iOS) were resolved by modifying the instructions for those questions (namely the GeoPoint and image attachment questions).

Once publicly available, the surveys can be accessed via URL. Survey responses are stored in the survey creator's Esri Survey123 account, which are aggregated and downloadable as both a spatial and non-spatial dataset. When downloaded as a spatial dataset, it can be used in GIS software for visualization and analysis.

1 Questions in italics indicate that they are only toggled to be included in the survey if the previous non-italic question is answered affirmatively by the respondent.

## REPORT ON USER RESPONSE TO TECHNOLOGY

The DCSA was evaluated by focus groups and beta testers regarding its effectiveness at teaching transportation planners, economic developers, and policy specialists about freight as well as its effectiveness from a technological perspective, i.e. usability. Feedback from testing can be found in the Results and Conclusions section of this report.

## DEPLOYMENT PLAN

The project team has identified additional courses where the DCSA can be deployed to extend its reach and introduce the walk audit exercise to a wider audience. This audience can include public sector officials, consultants, community college students, and high school students. The DCSA will be used in two Freight Academies offered by Caltrans for its planners and engineers in the summer and fall of 2019, and will be incorporated into lesson plans offered by the Academy of Global Logistics (AGL) at Long Beach's Cabrillo HS. AGL is a partnership of the Port of Long Beach, Long Beach Unified School District, and CITT. It will also be part of a pilot certificate program called Transportation Planning Professional + which offers planners a suite of functional skills not currently offered in traditional planning programs. The digital walk audit app will be part of a module on "Using GIS Tools to Tell Planning Stories."

The walk audit tool engaged with a national audience when it was presented at the 2018 American Planning Association (APA) conference in New Orleans. CITT continues to engage APA through its local chapter, planning schools, public agencies, the private sector and Esri as advisors, given that additional opportunities to refine the tool have been identified.

# III. RESULTS AND CONCLUSIONS

User feedback onthe DCSA during focus group testing was generally positive. Users noted the value of the DCSA for collecting data which can inform better decision making when it comes to planning, particularly over a paper and pen alternative. Users liked survey questions that toggled on/off depending on responses to prior questions. They noted that it helped them consider in greater depth the planning implications of the features they have assessed.. Health Administration students further noted that the DCSA afforded them a better perspective on planning in general, given their background in different fields.

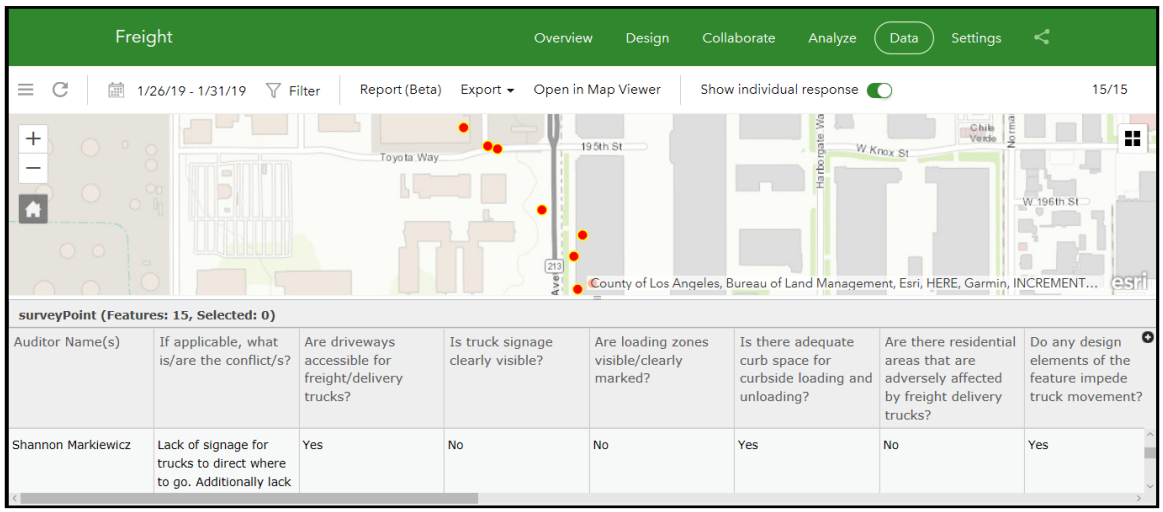


**Figure 7: Collected Data Visualized in Survey123**

Much of the user feedback led to tweaking of the DCSA to improve its usability and functionality. Users noted that certain questions needed to be clarified, given that in many cases it would not be the planner using the tool. One example of this is the question about conflicts between modes of transportation; how a “conflict” is defined, for example, needed to be clarified in an early version of the tool. Users also noted that “active” and “public” transportation modes need to be more clearly defined for the lay user. It was also noted that more picture attachments - to capture larger features from multiple angles - and date and time information would be useful to include in the surveys.

The Survey123 platform allows for each of these functionalities and they were added after receiving feedback. The ability to select more than one conflicting mode of transportation along with the question that prompts users to input names or descriptions of the feature were added after receiving feedback.

Certain issues were not able to be resolved. It was noted, for example, that the DCSA should ask whether or not the user really wants to refresh the browser when in the middle of completing a survey. This functionality pertains to the mobile internet browser the user is using and not the DCSA itself, and therefore cannot be resolved. Users also said they would like the ability to add question responses after having submitted a survey. This functionality is not available in the web surveys, but can be achieved during data processing

and cleaning. Users also noted that the ability to attach videos, as well as photos, would be useful, but this is not available in the platform. Additionally, some users thought the location question was not as easy to use as in other GPS applications. The format of the location question in Survey123 is unalterable to the survey creator, but feedback to Esri could help improve its usability.

One user noted that knowing the profession or background of whoever is filling out the survey could better inform the processing and analysis of responses. In cases where this is desired, users could include their background under the “Auditor Name” question that is included in each survey. This latter point is essential. As crowdsourcing of data gathering grows, the number of people undertaking traditional planning assessments also grows. The walk audit has the potential to serve as a tool to further democratize the planning process, and future generations of the tool must address the needs of different users, including those with different language and accessibility needs. For the planner, this should be viewed as an opportunity and not a threat. Better and more regular community input serve as one means to avoid more conflict later in the process.

# APPENDIX: LA METRO PAPER WALK AUDIT

## STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

- Multiple modes
- Multiple constituencies (gender, age, abilities, etc.)

Name of station: _____

Date/Time/Weather conditions during visit: _____

Station Typology: _____

## 1. SAFETY

| | Disagree/ Lacking | | Somewhat/ Adequate | | Strongly Agree/Ample |
|---|---|---|---|---|---|
| **1.1 Adequate lighting. (Night survey required)** Regularly spaced and frequent lighting that is directed towards the sidewalk and any bikeways, which provides sufficient illumination. Potential obstacles marked with reflectors or lighting. | 1 | 2 | 3 | 4 | 5 |
| **1.2 Eyes-on-the-street.** Presence of highly transparent ground-floors, windows, and entries. | 1 | 2 | 3 | 4 | 5 |
| **1.3 Well maintained public realm.** Sidewalks are smooth and without cracks, vegetation is trimmed, etc. | 1 | 2 | 3 | 4 | 5 |
| **1.4 Safety buffer for bikes.** Bikes are adequately set back from vehicles. Consider type and quality of buffer – sufficient width, painted material, vertical separation, such as bollards. | 1 | 2 | 3 | 4 | 5 |
| **1.5 Safety buffer for pedestrians.** Pedestrians set back from travel lanes via ample sidewalk width, landscaping, and street furniture. | 1 | 2 | 3 | 4 | 5 |
| **1.6 People-friendly traffic speeds and manners.** Drivers yield to pedestrians and traffic is slowed via narrow roadways, markings, no turn on red lights, etc. | 1 | 2 | 3 | 4 | 5 |
| **1.7 Clear safety signage.** Pedestrians set back from travel lanes via ample sidewalk width, landscaping, and street furniture. | 1 | 2 | 3 | 4 | 5 |
| **1.8 Overall, the station area feels safe.** Overall, there is a feeling of safety as you walk through the station area. Consider the safety of all users – especially **women, children, and the elderly**. Consider both day and nighttime safety. | 1 | 2 | 3 | 4 | 5 |

TOTAL SCORE

_____ / # questions answered

=

_____

(Average score on safety)

Page | 1

# STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

- Multiple modes
- Multiple constituencies (gender, age, abilities, etc.)

## 2. AESTHETICS

| | Disagree/ Lacking | | Somewhat/ Adequate | | Strongly Agree/Ample |
|---|---|---|---|---|---|
| **2.1 Sense of place.** Inclusion of unique street characteristic, landmarks, striping or a navigable streetscape hierarchy that sets this space apart from other areas. | 1 | 2 | 3 | 4 | 5 |
| **2.2 Pleasant landscaping.** Consistent landscaping that provides ample shade. Trees are well maintained and all tree wells are planted with street trees. | 1 | 2 | 3 | 4 | 5 |
| **2.3 Strategically placed pedestrian amenities.** There are a variety and sufficiently provided pedestrian amenities (seating, trash cans, water fountains) that are well maintained and inviting. Kiosks and vendors are present on pedestrian paths, are visually pleasing and are located in areas that do not interfere with foot traffic. | 1 | 2 | 3 | 4 | 5 |
| **2.4 Pedestrian unfriendly elements are limited.** There are a general lack of the following: unpleasant smells, blank walls, vacant lots, fences, noise pollution, unfriendly street conditions, trash. | 1 | 2 | 3 | 4 | 5 |
| **2.5 Pleasant experience.** Overall, there is a pleasant ambiance as you walk, bike, or use alternative transit throughout the station area. Consider the experience of all users – especially **women, children, and the elderly**. Consider both day and nighttime amenities. Care has been taken to make a nice environment for all users. | 1 | 2 | 3 | 4 | 5 |

TOTAL SCORE

_____ / # of questions answered

=

_____

(Average score on aesthetics)

# STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

- Multiple modes
- Multiple constituencies (gender, age, abilities, etc.)

## 3. ACCESSIBILITY

| | Disagree/ Lacking | | Somewhat/ Adequate | | Strongly Agree/Ample |
|---|---|---|---|---|---|
| **3.1 High quality sidewalks**<br>Sidewalks are large enough for pedestrians to walk, pass, and jog comfortably in opposing directions. There are very few disruptions to the sidewalk quality (e.g. smooth surface paving, signage and poles are set back from the pedestrian right-of-way). | 1 | 2 | 3 | 4 | 5 |
| **3.2 Clear, safe crossings.**<br>Signalized intersections allow ample time to cross, frequently allow passage, are a walkable distance (or provide a pedestrian refuge or median), are supplied with functioning push buttons, have minimal street crowns and are painted for safety. | 1 | 2 | 3 | 4 | 5 |
| **3.3 Seamless transit mode transfer.**<br>Transferring to alternate modes of transit is streamlined through the presence of well-marked, nearby, and obvious pathways. | 1 | 2 | 3 | 4 | 5 |
| **3.4 Operating and sufficient bicycle facilities.**<br>Bicycle facilities allow sufficient room, have a smooth surface, and provide riders with bike lanes, routes, pathways, adequate marking, parking, separated push buttons, bike stations and bike boxes. | 1 | 2 | 3 | 4 | 5 |
| **3.5 High quality signage.**<br>Signage is located in clear view for pedestrians, bicyclists, and other transit modes. Signage provides clear directional and locational information, regulatory warnings, and station area identity. | 1 | 2 | 3 | 4 | 5 |
| **3.6 Parking and drop-off is streamlined.**<br>Adequate number of parking spaces (in park-and-ride if applicable), room for drop-off (kiss-and-ride) on street parking serves as a buffer for pedestrians, parking time restrictions are in effect where necessary, and vehicles are prohibited from blocking the pedestrian right-of-way. | 1 | 2 | 3 | 4 | 5 |
| **3.7 Curbs and curb ramps are provided.**<br>Curbs and curb ramps are present at all crossings and have a gentle slope. | 1 | 2 | 3 | 4 | 5 |
| **3.8 Navigating the public realm is intuitive and easy.**<br>Overall, there are a series of passageways that are frequent and well marked as you walk through the station area. Consider the experience of all users – especially **women, children, and the elderly**. Consider both day and nighttime linkages. | 1 | 2 | 3 | 4 | 5 |

TOTAL SCORE

_____ /# of questions answered

=

_____

(Average score on accessibility)

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# STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

- Multiple modes
- Multiple constituencies (gender, age, abilities, etc.)

## ROUTE TAKEN

Include a blank map and note route taken during site visit

Additional opportunities & constraints:

Insert additional narrative from site findings.

## PHOTO DOCUMENTATION

Description of photo, keyed to issue number (e.g. 2.5) in checklist

Description of photo, keyed to issue number (e.g. 2.5) in checklist

NOTE: Add pages for additional relevant photos

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# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AGL | Academy of Global Logistics |
| APA | American Planning Association |
| Caltrans | California Department of Transportation |
| CITT | Center for International Trade and Transportation |
| CSUTC | California State University Transportation Consortium |
| DCSA | Digital Community-Source Audit |
| GIS | Geographic Information Systems |
| LA Metro | Los Angeles County Metropolitan Transportation Authority |
| LBSU | Long Beach State University |
| MTMC | Metropolitan Transportation Management Certificate |
| SCRTTC | Southern California Regional Transit Training Consortium |
| TRANSPORT | Transportation Research and Training |
| USC | University of Southern California |

# ENDNOTES

1. January 31, 2019. About CSUTC. California State University Transportation Consortium. Mineta Transportation Institute. https://transweb.sjsu.edu/csutc/about.

2. January 31, 2019. Survey123 for ArcGIS. Esri. https://www.esri.com/en-us/arcgis/products/survey123/overview.

3. *First Last Mile Strategic Plan: Path Planning Guidelines.* PDF 78–81 (Los Angeles, CA: Los Angeles County Metropolitan Transportation Authority, 2013).

4. Aanensen DM, Huntley DM, Feil EJ, al-Own F, Spratt BG (2009) EpiCollect: Linking Smartphones to Web Applications for Epidemiology, Ecology and Community Data Collection. PLOS ONE 4(9): e6968. https://doi.org/10.1371/journal.pone.0006968.

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Dr. Thomas O'Brien is the Executive Director for CITT in a full-time capacity and the Associate Director of Long Beach Programs for the METRANS Transportation Center, a partnership of CSULB and the University of Southern California. He also serves as the Director of the FHWA Southwest Transportation Workforce Center (SWTWC). Dr. O'Brien is an instructor in CSULB's Master of Science in Supply Chain Management (MSSCM), Global Logistics Specialist (GLS), Professional Designation, and Marine Terminal Operations Professional (MTOP) programs.

He is a member of the Transportation Research Board's Intermodal Freight Transport Committee and Intermodal Freight Terminal Design and Operations Committee. He also serves on the Boards of the Southern California Roundtable of the Council of Supply Chain Management Professionals, Los Angeles Transportation Club, Foreign Trade Association, and National Transit Institute. Dr. O'Brien also serves as Vice President of CUTC.

Dr. O'Brien has a Master's degree in Urban Planning and Development and a PhD in Policy, Planning, and Development from the University of Southern California. He is both an Eno and Eisenhower Transportation Fellow.

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Dr. Tyler Reeb is the Director of Research and Workforce Development for CITT, and the Associate Director of the Federal Highway Administration's Southwest Transportation Workforce Center housed at CITT. He also serves as the Editor of METRANS NEWS, a tri-quarterly publication that summarizes METRANS research, education, and outreach efforts. Dr. Reeb is the editor of the forthcoming book, Empowering the New Mobility Workforce: Educating, Training, and Inspiring Future Transportation Professionals, to be published by Elsevier.

Dr. Reeb leads research teams who address challenges and opportunities related to the new mobility workforce, transformational technology, institutional change, organizational management, and transportation systems management operations (TSM&O). He draws from industry benchmarking, labor market analysis, future scenario planning, systems thinking, enterprise resource planning, and GIS tools to produce research-driven reports, articles/white papers, books, and multimedia products that promote innovation and civic partnerships between leaders in business, government, and education.

Dr. Reeb was the lead author for a successful $1.5 million FHWA grant application to fund deployment of the National Transportation Career Pathway Initiative. He is a member of two National Academies of Sciences, Engineering, and Medicine standing committees focused on Transportation Education & Training and Native American Transportation Issues. Dr. Reeb has a Bachelor's in English Literature and Mass Media and a PhD in English with emphasis in Transdisciplinary Research Methods.

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# PEER REVIEW

San José State University, of the California State University system, and the MTI Board of Trustees have agreed upon a peer review process required for all research published by MTI. The purpose of the review process is to ensure that the results presented are based upon a professionally acceptable research protocol.

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