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EasyConnect: Low-Speed Modes Linked to Transit Planning Project

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EasyConnect:

Low-Speed Modes Linked to Transit Planning Project

Interim Working Paper

Task Order 5113

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ABSTRACT

The *EasyConnect Low-Speed Modes Linked to Transit Planning Project* (TO 5113) project represents the integration of innovative strategies to enhance transit use during the development and construction of a suburban transit oriented development at the Pleasant Hill Bay Area Rapid Transit (BART) District station in the East San Francisco Bay Area. This planning project brings together a unique partnership including small technology businesses, transportation agencies, city and county government, and academia. The project components include the introduction of shared-use low speed mode vehicles and electronic lockers at the proposed TOD. The evaluation of the *EasyConnect* field operational test (TO 6113-the next phase of this initiative) will provide insights into whether the introduction and integration of low-speed modes and elockers at the Pleasant Hill BART station can significantly increase transit access/use and cost effectively provide a last mile solution.

KEYWORDS
Transit oriented development, low-speed modes, intelligent transportation systems, bike lockers

EXECUTIVE SUMMARY

California's population is presently over 36 million and is expected to grow by about 19 percent (or 7 million new residents) by 2020 (*1)*. Motor vehicle travel in the State is expected to grow from 337 billion miles traveled in 2005 to over 457 billion miles in 2020 (*1)*. Smart growth policy strategies attempt to tame increasing auto travel, congestion, and vehicle emissions by redirecting new development into communities with a high-intensity mix of shopping, jobs, and housing that is served by high-quality modal alternatives to single occupant vehicles. The integration of innovative technologies with traditional modal options in transit oriented developments (TODs) may be the key to providing the kind of high-quality transit service that can effectively compete with the automobile in suburban transit corridors. A major challenge, however, of such an integration strategy is the facilitation of a well-designed and seamless multi-modal connection infrastructure – both informational and physical.

Currently, many transit agencies and communities across the country are participating in the creation of commercial, retail, and residential developments around transit facilities or TODs. Today, there are over 100 existing TOD projects in the United States. TOD projects currently exist primarily in conjunction with heavy-, commuter-, and light-rail stations, but also increasingly, in areas limited to bus service. Many TOD projects are located outside of major cities in new and mature suburbs.

The outcomes of this project will be the introduction, integration, and evaluation of multi-modal transportation services, both traditional and innovative technologies, at the Pleasant Hill Bay Area Rapid Transit (BART) District station/TOD site in the East San Francisco Bay Area, known collectively as *EasyConnect*. The project components include:

- Shared-use low-speed modes vehicles (electric bicycles, non-motorized bicycles, and Segway Human Transporters) available for commuting from the BART station to area businesses.
- Electronic lockers ("eLockers") at the station and nearby businesses that are a unique physical and technology design solution to the problem of low-speed mode access to traditional transit.

The evaluation of the proposed study will provide insights into three critical research and transportation planning questions:

- Can the introduction and integration of innovative technologies at TODs significantly increase transit access and use, and reduce auto travel?
- Can modal connection infrastructure effectively link new technology transportation services to traditional line-haul transit service?
- Can the demand for the new technology information and transportation services support their existence as independent businesses?

The project team represents a unique partnership including small technology businesses, private developers, transportation agencies, city and county government, and academia. This team

includes the California Department of Transportation, California Partners for Advanced Transit and Highways, BART, the Metropolitan Transportation Commissions, the Bay Area Air Quality Management District, Contra Costa Centre, Contra Costa County, 511 Contra Costa, Toyota Motor Company, General Motors Corporation, Air Products & Chemicals Inc., Millennium Partners, Segway LLC, and Giant Bicycles.

The *EasyConnect* field test includes a fleet of shared-use electric bicycles, non-motorized bicycles, Segway Human Transporters, and later possibly carsharing, directly responding to the call for innovative, out-of-the-box thinking in TOD problem solving (*2*). Leveraging public-private partnerships, this project incorporates such possibilities as electronic bicycle lockers to provide maximum safety and convenience for bicycle commuters, advanced parking reservations, and real-time parking information for motorists seeking to use transit. It is this kind of innovative approach that may ensure that TODs meet their broader goal of increasing transit ridership and encouraging the use of other sustainable transportation modes. The inclusion of shared-use, low-speed vehicles based at the TOD (with significant employment centers located within three miles) and aimed specifically at commuters represents a novel application of the shared-use low-speed mode concept both in the U.S. and Europe.

INTRODUCTION

California's population is presently over 36 million and is expected to grow by about 19 percent (or 7 million new residents) by 2020 (*1)*. Motor vehicle travel in the State is expected to grow from 337 billion miles traveled in 2005 to over 457 billion miles in 2020 (*1)*. Smart growth policy strategies attempt to tame increasing auto travel, congestion, and vehicle emissions by redirecting new development into communities with a high-intensity mix of shopping, jobs, and housing that is served by high-quality modal alternatives to single occupant vehicles. The integration of innovative technologies with traditional modal options in transit oriented developments (TODs) may be the key to providing the kind of high-quality transit service that can effectively compete with the automobile in suburban transit corridors. A major challenge, however, of such an integration strategy is the facilitation of a well-designed and seamless multi-modal connection infrastructure – both informational and physical.

The outcomes of this project will be the introduction, integration, and evaluation of multi-modal transportation services, both traditional and innovative technologies, at the Pleasant Hill Bay Area Rapid Transit (BART) District station/TOD site in the East San Francisco Bay Area, known collectively as *EasyConnect*. The project components include:

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This interim working paper includes the following sections: background on TODs in the United States and low-speed mode shared-use programs worldwide; the *EasyConnect* field test; the elocker field test enhancement**;** and research evaluation plan.

BACKGROUND

Transit Oriented Development

A comprehensive overview of the state of TOD practice in the United States, examining opportunities, challenges, and benefits is presented in the recent "Transit Cooperative Research Program Report 102: Transit-Oriented Development in the United States" (*2*). This report represents an extensive review of the literature, surveys, interviews, and ten case studies, covering a range of TOD configurations and practices. What follows is a summary of the key findings relevant to the *EasyConnect* project.

Currently, many transit agencies and communities across the country are participating in the creation of commercial, retail, and residential developments around transit facilities. While a range of configurations and definitions are found in the literature, there is general consensus among transit professionals as to what constitutes a TOD: "a pattern of dense, diverse, pedestrian-friendly land uses near transit nodes that, under the right conditions, translates into higher patronage." (*2*, p. 7)

TOD development is a complex process typically involving a myriad of stakeholders, each with a discrete interest in the ultimate development. Project partners often include transit agencies, private developers, environmental groups, alternative transportation advocates, supporters of affordable housing and open space preservation, private retailers, and private transportation service providers. Most interest groups agree that, if successful, TODs can yield many benefits, including increasing transit ridership and profits to public and private partners (*2*).

The pursuit of these objectives has resulted in the creation of over 100 existing TOD projects in the United States today. TOD projects currently exist primarily in conjunction with heavy-, commuter-, and light-rail stations, but also increasingly, in areas limited to bus service. Many TOD projects are located outside of major cities in new and mature suburbs. The San Francisco Bay Area leads the nation with the most identified TODs, served by BART (heavy-rail), Caltrain, the Amtrak Capital Corridor (commuter-rail), the Santa Clara Valley Transit Authority, and San Francisco Municipal Railway (light-rail) (*2*).

Considering the range and number of TODs, a natural question concerns the impact that these developments may have on local residents' travel patterns. Stakeholders are curious whether TODs are achieving their primary stated goals of increasing transit mode share, reducing use of single occupant vehicles, and encouraging use of other modes, such as walking and bicycling. Beyond these basic questions, the TCRP report identifies several areas for additional research. Specific issues that have posed challenges to the development of TODs to date, include:

- The importance of a multi-modal emphasis and pedestrian supportive design to the success of TODs;
- A need for innovative parking solutions to enable transit agencies to meet commuters' needs without posing undue challenges for TOD developers; and
- A general desire for innovative, "out of the box" thinking with respect to TOD problem solving. (*2*)

All of these issues are directly addressed by the proposed *EasyConnect* project at the Pleasant Hill BART station/TOD. To encourage transit ridership with a limited supply of available station parking, it is vital that TOD planners prioritize the creation of multi-modal connections at transit villages, including walking, bicycling, carsharing, and other supportive transit. The field test at the Pleasant Hill BART station emphasizes these supportive strategies that help passengers travel the first or last mile to or from the transit station.

This field test includes a fleet of shared-use electric bicycles, non-motorized bicycles, Segway Human Transporters ("HTs"), elockers, directly responding to the call for innovative, out-of-the-box thinking in TOD problem solving (*2*). Leveraging public-private partnerships, this proposal incorporates such possibilities as electronic bicycle lockers to provide maximum safety and convenience for bicycle commuters and advanced bike locker reservations. It is this kind of innovative approach that may ensure that TODs meet their broader goal of increasing transit ridership and encouraging the use of other sustainable transportation modes. The inclusion of shared-use, low-speed vehicles based at the TOD (with significant employment centers located within three miles) and aimed specifically at commuters represents a novel application of the shared-use low-speed mode concept.

Bicycle Sharing Programs

Bicycle sharing programs account for the vast majority of shared-use low-speed mode programs worldwide. Bicycle sharing programs vary significantly from one another in terms of their program goals, target demographic markets, operational models, and technological deployment. In some cases, programs operate with a membership fee and charge for bicycle use; more frequently, however, bicycle sharing programs operate free of charge and often consist of used and donated bicycle fleets. Most American bicycle sharing programs are located in small cities or college towns, and most operate as cooperatives whose goals are to increase mobility of target demographic groups (often students) and to encourage more sustainable mobility alternatives. Additionally, the cooperatives offer service beyond bicycle sharing, such as bicycle sales and classes for repair.

DeMaio (*3*) has identified four "generations" of public-use or shared-use bicycles, each with increasing levels of technical sophistication. The more highly developed programs are currently under operation in Europe, with some technologically advanced programs under consideration for the U.S. Many of the European bicycle sharing programs are located in major cities and are specifically designed to help ease traffic congestion and increase mobility options in crowded city centers. The programs operate with a variety of technological sophistication. The most basic programs, such as in Copenhagen (*4*) and Helsinki (*5*), simply depend on a coin deposit of approximately $2, which is then refunded when the bicycle has been returned. However, some of the more technologically advanced systems, such as in Amsterdam (*6*) and Oslo (*7*), use innovations such as "smart" chip cards to gain access to bicycles stationed on computer-operated racks, automated systems that enable credit card billing, instant program sign-up, and instant reservations. These more sophisticated programs functionally operate in ways more similar to carsharing programs (i.e., short-term vehicle rentals) than to other, less advanced bicycle sharing programs. Across Europe, these programs are targeted to both tourists as well as residents. The

programs, in general, are quite successful. An extreme example is given in Copenhagen, where a shared-use bicycle was followed by reporters for 12 hours, who found that it spent only eight minutes not in use (*3*).

The "Station Oxygène" was opened in December of 2004, in Lille, a city of 1.2 million residents in northern France. The station offers a total of 16 Segway HTs and 25 electric bicycles for rent by the half-hour, half-day, day, weekend or month, and there is a ten percent discount on rentals to anyone with a public transportation ticket (*8*). The station is located in the city center, near a large parking lot and railway station. The program is aimed at residents (including a large student population) and tourists, as well as commuters. The program is specifically aimed to promote the need for "greater choice and connectedness of mobility options with transit." (*9*, p. 3).

THE FIELD TEST

The *EasyConnect* field operational test was launched in August 2005 to introduce shared-use electric bicycles, non-motorized bicycles, and Segway HTs (known as the "low-speed modes") at the Pleasant Hill BART station. See Figure 1 below for a photograph of the existing Pleasant Hill BART station. The field test is designed to appeal to those who would like to take BART to commute to work, but are stymied by the inevitable "last-mile" problem.

FIGURE 1 Current site conditions, Pleasant Hill BART station.

EasyConnect currently connects employees of Contra Costa Centre based WildPackets and Fresenius Medical working with 511 Contra Costa. The low-speed mode vehicles are stored nightly at the Pleasant Hill BART station. Commuters are able to ride the units from the BART station to their offices in surrounding employment centers in the morning and back to the station at the end of the day ("commuter-use"). The devices can also be used to run personal and business errands during the day when are stored at the employment locations ("day-use"). In

addition, some units will soon be located directly at employment locations at the Contra Costa Transit Village to provide day-use options for those who commute by vanpool or carpool.

There is an extensive paved trail network in the Pleasant Hill BART area. The East Bay Parks District has granted permission to the research project to use the Iron Horse and Canal trails for "non-motorized" trails for the purpose of this program. Access to the trails greatly enhances the BART, employment, and shopping connections. See Figure 2 of rider on a bicycle trail in Pleasant Hill.

FIGURE 2 Bicycle rider in Pleasant Hill.

ELOCKER FIELD TEST ENHANCEMENT

As Grover (*10*) points out, traditional bicycle lockers are relatively inefficient because usually each locker is reserved for an individual who has pre-paid for the locker on a yearly basis. Often, the lockers will sit empty and unused. A shared-use, technologically advanced electronic locker system ("eLockers") can increase approximately five-fold the number of cyclists (and other low-speed mode users) that can be served by traditional lockers. See Figure 3 for an illustration of the increased number of bicyclists served by eLocker technology. The secure eLockers work like metered curbside parking: Users only pay for the eLockers when they are using them. The lockers will be accessed using specially designed smartcards, which will facilitate manual phone-in reservations, automated secure pick-up of vehicles, and data collection for fleet management and assessment (*10*).

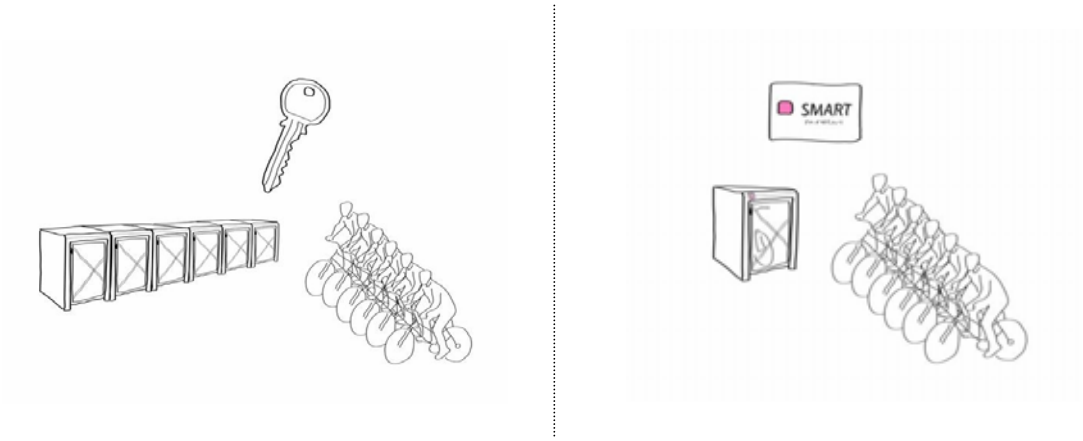

FIGURE 3 Diagrammatic illustration of increased number of riders served by eLocker technology, reproduced from (*10*).

EasyConnect participants currently use four temporary electronic locker units (loaned from BART to the project) to store the low-speed modes at the Pleasant Hill BART station. Contributions from Contra Costa County, Contra Costa Centre, 511 Contra Costa, and the Metropolitan Transportation Commissions will allow for the installation of 24 elockers at the Pleasant Hill BART station. These lockers will be operated as part of the EasyConnect field test for three years and then be donated to BART. The permit process for the lockers is near completion and installation is planned for early 2006. What follows is a discussion of the planned implementation process for the elockers at the Pleasant Hill BART station.

eLockers will facilitate manual phone-in reservations, automated secure pick-up of vehicles, and "sneakernet"-based data collection for fleet management and assessment. The lockers will be accessed using ISO-7816 compliant smartcards (same standard as TransLink™). Training for data collection and management functions will be provided by the technology supplier (eLock). Specific components to be installed are:

1. Lockers,
2. Electronic lockboxes,
3. Wiring and power supply system,
4. Charging cables for Segway HTs and eBike, and
5. Vehicle presence sensing devices.

The second technology deployment will network the lockers and permit review of status and availability of low-speed vehicles (their presence in the lockers or not) from the Internet. This will provide centralized fleet management capabilities and project assessment data available from the web. The locker network communication system will be customized for the site-specific conditions and be based on the results of the technology review. This task will include testing.

Specific hardware components to be installed are the hub, eLock firmware upgrade, wireless link, antennae, and project specific web-interface.

eLock will customize the locker status information feed to comply with the mobility options protocol established. The feed will be published so that other web-connected services (such as 511.org) could display locker and low-speed vehicle status. This step will provide an initial testing platform for the mobility options protocol.

Researchers will install a reservation system customized for this project. The reservation system will allow low-speed vehicles in lockers to be reserved for use at a specific time window in the future. The system will manage walk-up, checkout access to ensure that a vehicle is available during the reservation time window, yet maximize availability of vehicles for other users prior to the reservation window. Selection of the system to be installed will be informed by the technology review.

CONCLUSION: RESEARCH EVALUATION PLAN

The *EasyConnect* research evaluation plan will be designed to test the hypothesis that the seamless integration of new technologies into an existing rail station and new TOD can significantly enhance transit access with related travel, health, and economic benefits. Researchers will employ before-and-after instruments, as necessary, including:

- Observational analyses related to modal and parking use in and around the site,
- Focus groups that include users and bystanders,
- In-person interviews with users and bystanders, and
- Questionnaires and travel diaries.

The evaluation plan will be designed to provide answers to the following key questions:

- What are the unmet access and egress travel needs in and around the Pleasant Hill BART station/TOD site?
- What are the key field test service design requirements to best meet those needs (e.g., ease of use, security, and reliability)?
- How do the new field test services affect travel patterns (e.g., mode choice and auto use)?
- What are the health effects of the field test services (e.g., net increase in physical exercise from increased transit and bike use)?
- What are the economic benefits of the new field test services (e.g., reduced fuel and vehicle ownership costs, and time savings)?
- Can the demand for the services introduced by the field test support their continued existence as viable independent businesses?

In sum, the evaluation of the integrated technology *EasyConnect* field test will include behavioral responses, cost-effectiveness of the integrated technologies, and summary of lessons learned that can be applied to future technology enhanced transit TOD developments.

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