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The Impacts of Infill Rail Transit Stations: Implications for the Shinn Station Proposal

Authors

Deakin, Elizabeth, J.D.

Halpern, Jeremy

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The Impacts of Infill Rail Transit Stations: Implications for the Shinn Station Proposal

A Research Report from the University of California Institute of Transportation Studies

Elizabeth Deakin, Professor Emerita, College of Environmental Design, University of California Berkeley

Jeremy Halpern, Graduate Student, College of Environmental Design, University of California Berkeley

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16. Abstract

Infill rail transit stations are being implemented to improve access to transit as well as to encourage and support urban development and revitalization efforts. The stations are relatively low-cost because they use existing track and equipment, but costs vary substantially depending on the complexity of the station design and its surroundings. Travel time savings can accrue to passengers using the infill station, but the added stop will increase time for some riders and may necessitate changes in equipment, schedule, or both. Ridership at the infill station depends on the size of the area made more accessible as well as the amount of new development and intensified activity that occurs in its vicinity. Findings from the literature and US examples are used together with a preliminary site assessment and interviews to identify the issues that would be raised by a proposed infill station linking multiple services in the San Francisco East Bay. The concluding section summarizes factors that should be considered in evaluating the impacts of proposed infill stations and discusses the broader implications for regional planning.

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Disclaimer

Author Contribution Statement

The authors confirm contribution to the paper as follows: study conception and design: Deakin; data collection: Halpern, Deakin; interviews: Halpern, Deakin; analysis and interpretation of results: Deakin, Halpern; draft manuscript preparation: Deakin, Halpern. Both authors reviewed the results and approved the final version of the manuscript.

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UNIVERSITY OF CALIFORNIA INSTITUTE OF TRANSPORTATION STUDIES

August 2018

Elizabeth Deakin, Professor Emerita, College of Environmental Design, University of California Berkeley

Jeremy Halpern, Graduate Student, College of Environmental Design, University of California Berkeley

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Executive Summary

Infill rail transit stations are being implemented to improve access to transit as well as to encourage and support urban development and revitalization efforts. The stations are relatively low-cost because they use existing track and equipment, but costs vary substantially depending on the complexity of the station design and its surroundings. Travel time savings can accrue to passengers using the infill station, but the added stop will increase time for some riders and may necessitate changes in equipment, schedule, or both. Ridership at the infill station depends on the size of the area made more accessible as well as the amount of new development and intensified activity that occurs in its vicinity. Findings from the literature and US examples are used together with a preliminary site assessment and interviews to identify the issues that would be raised by a proposed infill station linking multiple services in the San Francisco East Bay. The concluding section summarizes factors that should be considered in evaluating the impacts of proposed infill stations and discusses the broader implications for regional planning.

1. Introduction and Research Approach

Infill rail transit stations are added along an already built line or set of lines between existing stations. Such stations are relatively low cost because they take advantage of existing track and operations. While infill stations are relatively rare, both urban and suburban examples have emerged in the United States over the past two decades.

Infill stations have been implemented for a number of reasons. One is to provide service to an area that is under-served, either because previous services are no longer available or because substantial growth has occurred in the subarea since the rail system was developed. An infill station can support additional transit ridership by increasing station accessibility, especially if the existing stations on the line are more than a mile apart.

Infill transit stations also may support transit-oriented development – offices, retail, and housing. This can be new growth, or it may be redevelopment and revitalization of existing uses; in some cases it may be a reorganization of regional activities. Accessibility to transit is likely to attract land uses that can make use of the service, increasing transit ridership. In turn, growing ridership at an infill station may support higher levels of service (larger trainsets, more frequent service), resulting in a better level of service for other stations along the line.

While increasing ridership is a major justification for an infill station, the addition of a station does not guarantee that ridership will grow. If existing stations are already close together, an infill station may cannibalize ridership from the other stations. Transportation level of service plays a role as well; stations serving a single line with limited service will achieve lower ridership (and offer lower development potential) than will stations with frequent service(s) and links to other lines or transport systems. Also, because stopping at the infill station adds deceleration, dwell time, and acceleration time to existing trips, there is a small negative impact on existing riders due to the added stop. Further, accommodating the stop may require schedule adjustments, potentially including reduced frequencies in some cases. The cumulative impact of such small changes can be a deterrent to transit use for some.

While infill stations can strengthen existing activity centers and neighborhoods and generate new development, there is no guarantee that they will do so. New housing and commercial development opportunities around infill stations can be substantial if there is regional and sub-regional demand for development, the station location has few inherent limitations, local government policies and community members support growth, and existing owners can expand or developers can secure suitable sites for new construction. On the other hand, economic development can be limited if demand overall is low, the station site is difficult to develop, there is community opposition to growth, local policies are impediments, properties available for development or redevelopment are few, or for a variety of other reasons there is limited interest in investing in the station area from the business and development community.

Constructing an infill station can be a complex process. An infill station is usually less expensive to build than a station on a new line or extension because it can use existing track and other system equipment. However, context and station design can make a substantial difference in cost. Station footprint and construction options may be constrained by the need to keep existing services operating and minimize disruption to the surrounding area. Linking lines and services and helping passengers traverse complex road networks may require substantial pedestrian overpasses or underpasses as well as sidewalk and cycle lane improvements. In some cases, streets will need to be added or reconfigured, generally a costly prospect. If the station is underground or elevated, it will be far costlier than it would be at ground level.

In this paper we examine the costs and benefits of infill transit stations. We draw upon the literature to establish an evaluation framework and identify likely impacts. We then present evidence from experience with infill transit stations in Chicago, Washington, and the Boston and San Francisco Bay Area metropolitan areas, based on published materials as well as on a series of interviews with professionals who have been involved in the station development. We apply the findings from the literature and the four examples to the case of a proposed infill station in the Shinn Station area of Fremont, CA, where an intercity train, metropolitan rail, and other regional and local transit services could be brought together. The concluding section summarizes the key issues to be considered in evaluating infill station proposals and discusses the implications for regional transit planning.

2. Framework for Evaluation: Literature Review

Transit investments have been pursued not only for their transportation services but because they are seen as serving broader social, economic and environmental goals. However, the high cost of many transit services has raised concerns about cost-effectiveness. As a result, a sizeable literature has developed documenting how transit services generate costs and affect travel choices, social equity, urban traffic levels, land uses and development patterns, air pollution, noise, and a variety of other matters.

Travel modeling has been an important source of insights about transit's impacts. Studies dating back to 1970s developed disaggregate behavioral travel demand models and used them to investigate the impact on travel behavior of changes in access and egress times, wait times, and transfers as well as on-board travel times and costs (McFadden, 1972; McFadden and Reid, 1975.) These models generally showed that access, wait and transfer times are two to three times more onerous than time spent in a vehicle, hence interventions that reduce these onerous elements of a trip are highly valued.

Additional models were developed that showed how transport service levels and overall accessibility further influence household location choices (McFadden, 1978). The modeling methodology that these early works introduced quickly became the standard (Ben Akiva and Lerman, 1985) and it remains in widespread use in research and practice. Over the next several decades advances in travel analysis have expanded and deepened the understanding of travel behavior and responses to travel conditions.

In parallel, in the 1970s and 80s, scholars responded to concerns about the negative impacts of the automobile on urban living by exploring strategies for reducing auto demand through improvements in transit, bicycle and walking options, pricing policies, and over the longer run, land use strategies (Deakin, 1989.) A large body of research investigated particular impacts of transportation projects and explored ways to capture benefits and reduce harm. Among the topics that have received considerable attention are air, noise, and water pollution, petroleum dependence and alternative fuels, and transportation's role in economic development and employment opportunities.

The linkage between transportation and urban development has been a particular focus of research and practice. A number of studies have examined higher density around transit (Steiner, 1994) and proposed mixed use, transit-oriented development (TOD) as a comprehensive solution (Kockelman, 1994; Cervero, 1994; Cervero, 2002; Cervero and Arrington, 2008 Ewing and Cervero 2010, Dittmar and Ohland, 2012, Ratner and Goetz, 2013). Scholars have also investigated the travel behavior implications of TOD (Kockelman, 1994; Brons et al., 1997), its fit in the urban fabric (Loukaitou-Sideris 2013), and its environmental impact-reducing potential (Kimball et al., 2013). However, virtually all of these studies focused on the areas within a quarter mi. to half mi. radius around the station and did not consider the consequences of TOD for corridor-level travel times and related impacts. Some have looked at infill TOD development internationally (e.g., Loo et al. 2017) but the dense megacity environment likely does not fit the American context.

At the regional scale, a number of studies have compared alternative regional development scenarios and their impacts, for instance massive investments in transit and a refocusing of development to transit station areas vs. major highway expansion and low-density sprawl development (e.g., 1000 Friends of Oregon's LUTRAQ project, multiple volumes, 1992-1997). Motivated by concerns about congestion, air pollution, and other quality of life issues, these regional scenario studies provide insights into large scale impacts, but for the most part they lack the resolution to reveal much about smaller scale or incremental investments such as a single infill station would represent.

In the last several years, modeling has been used extensively in California to assess the impact of transportation and land use strategies intended to reduce greenhouse gas emissions (Heminger et al., 2011; Barbour, Newmark and Deakin, 2011; Newmark and Deakin, 2011.) While much of the work looked at regional impacts, the models for at least some of the studies increasingly took an integrated approach to transportation, land use and environment. Such models build from the microscale (individuals, households, local streets, parcels) to the regional and thus offer the ability to observe a variety of behavioral phenomena (Waddell, 2002; Waddell et al., 2010). However, the complexity of the models makes them hard to explain to non-experts (Waddell, 2011) and as a result many agencies use a combination of regional model outputs, simplified models, case study evidence, and qualitative assessments to estimate their projects' likely benefits and costs.

Today, it should be possible for a regional agency to use its data and models to produce a robust estimate of the ridership a transit infill station would be likely to generate, as well as the environmental impacts that such a station would have (or would avoid.) In California, many county transportation agencies and transit operators also have these capabilities, although they may be limited to the jurisdictional boundaries they serve.

Cost-benefit analysis (CBA) has been used for pulling together the knowledge gained from such studies to produce an assessment of a particular project or program. CBA's appeal is that it systematically identifies, measures, and evaluates the benefits and costs of an action -- expressed in monetary terms -- and accounts for their timing and duration. Its limitations include the difficulty in monetizing some impacts (e.g., environmental capital - see Mackie et al. 2014), the masking of certain important distributional impacts due to aggregation, as well as ongoing debates over what discount rate to use for benefits and costs that occur in the future and the length of the appraisal period to be used. As an example of the latter issue, a typical US transport project is evaluated for a 20-year period vs. 60 years in most European countries and 30 years in New Zealand and Australia. (Mackie, op. cit.) The specific choices made by the analyst (and in some cases, embedded in software tools for evaluation) can change the analysis results, as can input forecasts and assumptions about future population, employment, vehicle operating costs, policy mandates, etc. (See, e.g., Flyvjerg et al., 2003, for a discussion of these issues.) Authorities therefore recommend explicit discussion of these choices as well as uncertainty with regard to inputs.

The Federal Transit Administration has issued guidelines on CBA for use in the evaluation of the transit projects it funds (FTA 2017.) The guidelines caution that CBA analyses must avoid double counting (e.g., including both direct benefits and their secondary and tertiary impacts) and counting as benefits changes that are actually transfers. However, sometimes it is the secondary and tertiary impacts and transfers that are of greatest interest to decision-makers. For example, local officials may be interested in avoided costs such as the number of park and ride spaces that would not have to be added at existing stations if a new station were built instead, or may want to know about transfers such as the number of jobs likely to relocate close to transit and what areas would lose those jobs. In addition, rather than review just a ratio showing total societal benefits and costs, decisionmakers often want to see the incidence of impacts – who gains and who does not. As a result, analysts frequently present secondary and tertiary impacts of interest as well as direct costs and benefits, discuss qualitative evidence for items that are hard to quantify, and disaggregate the information to show how impacts are distributed.

Table 1 shows some of the key impacts - costs and benefits – that often arise when evaluating rail transit systems and infill stations in particular. Note that some of these items would be considered "double counting" if put into a single CBA. Note also that while most impacts occur once the station opens, some occur during construction, some may anticipate the station opening, some may lag it, and some may not develop at all.

Of the items listed, travel time savings and station costs are key; travel time savings will determine whether the station attracts new riders and lifecycle costs of the station and related facilities (capital, operation and maintenance) are the key costs.

Travel time saved is the principal benefit for many transportation projects (Hensher 2011). Many other impacts (e.g., emissions and energy savings) depend on the net effect travel time changes have on mode choice. For infill stations, it is important to look at overall travel time effects for all affected users. Travel time (access and egress time) may decrease for those for whom the new station is closer to their trip origin or destination, but the added stop will increase in-vehicle travel time for on-board passengers not embarking or disembarking at the station. An infill station also may provide a shorter or more convenient transfer location, reducing backtracking or other undesirable trip routings.

The largest cost is generally the capital cost of the station. Costs vary significantly with design; elevated stations can cost twice as much as ground-level ones and underground stations are 4-6 times costlier on average (Flyvbjerg et al. 2008). Station costs also depend on whether there is one boarding platform or two, as well as on the elaborateness of passenger shelters, information systems and signs, ticket machines, faregates, security systems, and passenger circulation and access facilities. Staff booths, restrooms, and on-site space for retail can also be included internal to the station. Car parking, bus bays, bike lanes and parking, taxi stands, passenger drop-off zones, pedestrian bridges to nearby land uses, and in some cases, housing and commercial development on transit agency property may also be part of an infill station plan. Depending on local policy these latter costs (and their revenues if any) could be part of the project, left to the discretion of a local government or private entity, or handled as a shared public-private responsibility. Who takes on various facilities not only affects initial costs but also likely determines who will be responsible for ongoing management, operations and maintenance.

Adding a station may also necessitate adjustments to operations. This can mean a change in timetables as well as potential modifications to trainsets and number of trains to accommodate additional riders. While the impact on schedule is likely to be small, on the order of 1-2 min. if just one stop is added, an agency may have to reduce frequencies in order to include the stop. If so, the lower frequencies can result in a loss of riders at other stations across the system.

Table 1: Possible Impacts of an Infill Transit Station

Benefits	Description
Travel time savings for those utilizing the new station	New passengers and some who will shift from other stations can benefit. Access time savings are more valuable by a factor of 2-3 than in-vehicle time savings.
Reduced VMT	Due to mode shift from cars -VMT usually declines even for trips using drop-off/pick-up modes for station access.
Avoided car crashes/ Increased safety	Depends on mode choice / reduced VMT, including access mode to station, and where VMT reduction occurs (speeds affect severity of crashes)
Increasing local economic activity for existing businesses	Spillover from users traveling to and from station, potentially from growth in area
Increasing local economic activity - new development	Increased accessibility lowers cost of increased activity
Increased nearby property land value	Increased accessibility increases the value of the land near the station
Local circulation impacts - positive	Due to redesign of street, bike pedestrian networks to serve station and connect it to ridership catchment area
Network Effect (Externality)	The positive economic effect of growing a network and/or its ridership – can be regional
Environmental benefits	Reduced emissions, noise due to reduced auto use
Health benefits	Due to reduced auto use as well as potentially higher use of active access modes
Social benefits	May provide increased access for communities of concern
Improved farebox recovery	Per net ridership increases

Costs	Description
Capital investment costs of station and related infrastructure	Design & build station, parking if provided on station property, ditto bus turnouts, taxi/Uber stands, bike parking, internal sidewalks, etc. ("station plus"). May trigger need for site clearance, remediation, relocation assistance, etc.
Offsite capital improvements	May be required as a condition of station approval / for environmental mitigation
Increased passenger-related operating costs	Due to ridership increases due to added station
Maintenance and operating costs of station and related facilities	On-site and potentially off-site
Increased travel time for all passengers not embarking/ disembarking at infill stop	For all passengers on the line that pass through but do not use the stop, dwell time, deceleration, acceleration will be added to their total travel time (1-3 min. depending on train technology etc.)

Costs (continued)	Description
Localized traffic impacts	Primarily if station parking is provided; additional impact from bus, taxi, dropoff/pickup modes; may require signals, ped crossings, etc.
Increased travel time for all passengers during construction period	A combination of weekend closures, slow zoning or single tracking will increase travel time of passengers on the line during the construction phase
Capital investment costs of needed offsite infrastructure	Street redesigns (see above), bike lanes, sidewalk imp., etc.
Crowding	If line is at or near capacity before addition of station and services are not adjusted, crowding could lower the quality of service for existing passengers, possibly driving some away
Additional trains, larger /longer trainsets, or schedule modifications to maintain headways, avoid crowding	May not require new equipment if no capacity problem
Construction-related impact on local businesses	Local businesses may see less foot traffic due to nearby construction
Crime, safety	Onboard, in station, and during access, egress trips
Construction-related environmental impacts	Noise, air pollution emissions, vibration due to construction equipment and potential slowing of passing trains; possible light pollution, impacts on water quality, historic artifacts, communities of concern
Longer-term environmental impacts	Potential air pollution exposure from access modes; noise, vibration from trains; noise, light pollution from station; hardscape effects on runoff/drainage/water quality; site-specific impacts such as impact on environmentally or culturally sensitive sites
Energy impacts	Acceleration and deceleration of additional trains will increase power requirements; so will larger trainsets; station will require power; impacts will depend on design and energy sources
Neighborhood character	Political issue in many areas; land use changes may affect demographics, activities in station area, “small town” nature of surrounding neighborhoods, mix of own vs. rent, etc.
Displacement, rent increases	A hazard of increased property value in proximity to the station; gentrification concerns
Refs.: US DOT 2017; Mackie et al. 2014; Hensher 2011; Schlickman et al. 2015	

3. Four Examples of Infill Stations

3.1. Morgan Station—Chicago

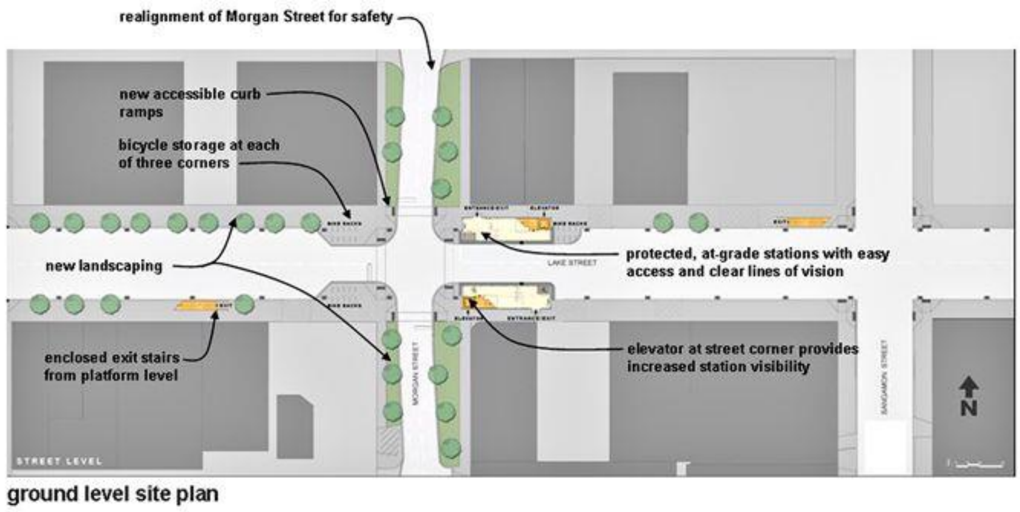
The Chicago Regional Transit Authority's Morgan Station, which opened in 2012 in the up-and-coming Fulton Market District, is located at the intersection of N. Morgan St. and the major thoroughfare Grand Avenue in the West Loop area of Chicago. The station serves the Chicago RTA's Green and Pink lines and is also linked with buses and other transportation services.

Morgan Station had been part of an elevated rail line that operated from the late 1800s through the 1940s, but the station was closed in the early 1950s due to declining ridership. The neighborhood continued to have service at the Halsted Station a few blocks away until it too was closed during a Green line rehabilitation in the 1990s. After considerable lobbying by local residents and businesses, a new station plan was created. At the time, the West Loop area of Chicago was beginning to redevelop, with light industrial buildings being converted into lofts. The construction of the United Center, home of Chicago Bulls and Blackhawks, helped spur the district's rejuvenation. In 1997, the local alderman secured tax increment financing (TIF) for the area. Chicago DOT (CDOT) matched TIF funds with federal Congestion Mitigation and Air Quality (CMAQ) funds to develop the station (Lev 2014)

CDOT was responsible for the project, which had a $38 million construction budget. Design and construction was complex, with each platform constrained to a maximum width of 18 feet. The project also contended with constraints that accompany building around, above and below a running heavy rail line in a busy urban district.

Figure 1. Morgan Station, Chicago Transit Authority. Source: World Infrastructure News. 2013

Figure 2. Morgan Station Plan. Source: Inhabitant.com



The station has two 425 ft. side platforms, each with a 320-foot canopy. A walkway was built above the platforms so passengers would not have to leave and reenter to access the other platform. Glass was heavily used in the station design to increase station users' visibility and perception of safety.

No car parking is provided, though bike racks are available. Bus lines do not serve the station directly but are about three blocks away.

Service to the station, which opened in May 2012, consists of eight Green line trains and 6-7.5 Pink line trains during the weekday peak periods, with less frequent service off-peak. Average weekday boardings of 2891 passengers were reported in October 2016, resulting in a station ranking of 90th out of 145 stations for the CTA (Vance 2016.)

Despite its modest ridership, the station is credited for spurring additional economic development in its vicinity. Using ridership data, commercial rental data and building and business licenses, CTA found that residential and business development in the surrounding neighborhood has grown faster than nearly every other market in the city since the recession. This includes a greater than 20% increase in business licenses. However, some of the development relocated from other parts of the city, as was the case for several large companies including Google and several well-known restaurants (McGhee 2014.)

3.2. NoMa-Galludet Station—Washington DC (Formerly known as New York Ave–Florida Ave-Galludet University Station)

When the Washington DC Metrorail system was being planned in the 1960s, the area around the New York Avenue corridor was industrial and had few potential riders. Planners skipped proposing a station there, leaving a 1.5-mile gap between stations (Parsons Brinckerhoff 2010.) By the 1990s industrial uses had declined and the area was mostly railroad yards, warehouses and parking lots. However, the area was seen as ripe for development and the National Capital Revitalization Act (1997) among other things called for the construction of a new Metro station at New York and Florida Avenues and redevelopment of the surrounding area (NCPPP 2006).

The station, which opened in Nov. 2004, cost approximately $105 million. Half of the funds for the new station were provided by the city, one quarter from the federal government and one quarter from private developers through a special taxing district (Schlickman et al., 2015.) The District later formed the NoMa Business Improvement District (BID) in May 2007 to continue to support economic development and implement physical improvements, using fees levied on commercial, hotel and multi-unit residential properties (NCPPP 2006.)

In the ensuing years, massive new development has occurred in the area, transforming it to a highly urban district of offices, shops, restaurants, and housing. Today, established residential neighborhoods lie to the north and south. To the east is Gallaudet University, a university for deaf and hard-of-hearing students, and the Florida Avenue Market (also known as Capital City Market), a farmers' market and wholesale food distribution center. Midrise commercial office buildings lie to the south and west.

The station is elevated, with a canopy over its 600 ft. single platform to protect passengers from the elements. Several bus routes stop just outside the station, and bike paths link to the station, where bike parking, but not parking for cars, is provided.

The station has been successful in attracting riders, ranking 20th of the 91 stations in the Washington Metro system. Average weekday boardings of 9038 passengers were reported in February 2016. This strong ridership performance reflects the rapid and extensive redevelopment of the station area, whose assessed value rose from $535 million in 2001 to $2.3 billion in 2007. Public agencies have played a role in the area's renewal; several federal agencies moved to part of the 16 million square feet of new building space (MacCleery 2012.) WAMATA has been actively engaged in station area development, with its activities led by a senior staff member with significant experience in private real estate development as well as in transit. Though the city has gotten significant returns, it is recognized they could have asked for more: "The public sector supplied over two-thirds of this project's funding. Had a more intensive market research study been conducted, it is likely the private sector would have been asked to contribute a larger portion of the funding." (NCPPP 2006)

Figure 3. NY Ave.-FL-Ave.-Galludet U. Station. Source: Parsons Brinckerhoff.

Figure 4. Existing Land Use and Neighborhoods (in 2006). Source: Parsons Brinckerhoff

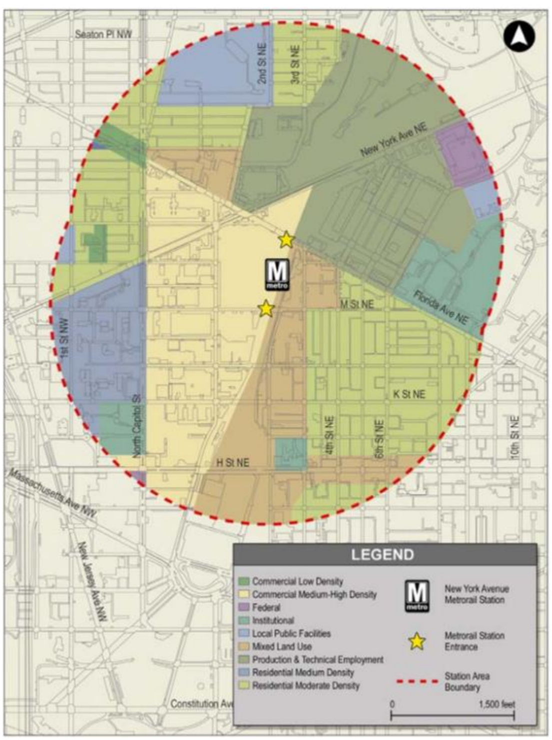


Figure 5. NoMa – Galludet Station, Washington, DC. Source: http://urbanstudies.tumblr.com/

3.3. Assembly Station – Somerville, MA (Boston Metropolitan Area)

Assembly Square is located in Somerville, Massachusetts, a few miles north of downtown Boston. The area was named after a Ford assembly plant that closed in the late 1950s along with most of the other industries that for a time had been the core of the local economy. In 1979, the city declared the area blighted and began redevelopment, approving a conventional suburban-style shopping mall on part of the old Ford site. By the late 1990s that mall was mostly shuttered and big box retail began to be developed in the area. Community organizers, envisioning instead a pedestrian-friendly mixed-use development providing jobs, housing, and local-serving retail, fought the big box proposals. The city's 2000 redevelopment plan largely reflected the community group's alternative vision and in 2005, Federal Realty Investment Trust (FRIT) purchased the Assembly Square mall for redevelopment into mixed use (Draisen 2014.)

A new Massachusetts Bay Transportation Authority (MBTA) rail station was incorporated into the plan as an infill station on the existing Orange Line. Construction of the station cost approximately $55 million. About half of the funding came from the state's Executive Office of Housing and Community Development, with $16 million from federal transportation funds and $15 million from the developer, FRIT.

The above-ground station is served by 10 trains per hour during peak periods and 6-7 trains per hour off-peak. North and south entrances are connected to the platform via overhead footbridges. Three bus routes are located 1-2 blocks from the station. No parking is provided, though the surrounding development has parking at a price similar to that at MBTA stations.

Ridership at the station is currently modest, on the order of 2800-3000 riders per day. As development proceeds, ridership is expected to increase, reaching an estimated 5000 daily boardings by 2030. However, since access to the station from surrounding communities is constrained, with the Mystic River and major highways forming barriers, ridership is likely to be heavily dependent on development in the immediate station area.

The Assembly Square development has attracted several large employers, including the corporate headquarters of Partners Healthcare, the state's largest hospital and physician organization g (4500 jobs.) A software company also moved its headquarters to the area (Song et al. 2017). In both cases, the jobs were previously located elsewhere in Massachusetts, so the result is less "job creation" than "job relocation." However, the new site has considerably higher transit use potential than previous sites, making it likely that VMT and emissions are lower than they would have been had the jobs not moved to the transit-friendly site.

Figure 6: *Area Plan, Assembly Square Somerville MA (Boston Metro Area). Source: Building BOS. July 2014.*

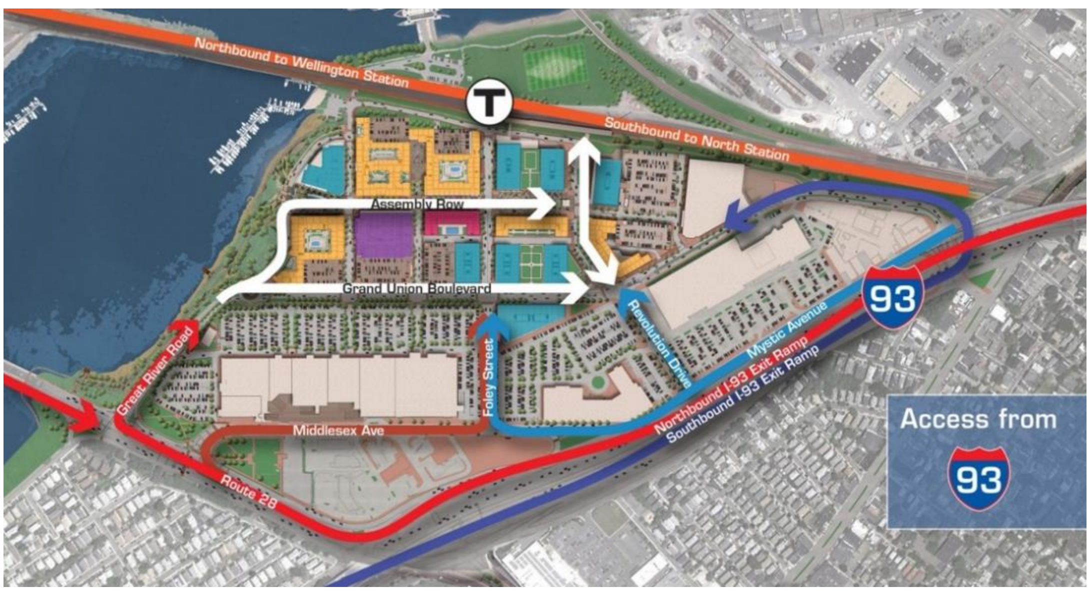


Figure 7. Area Plan, Assembly Square Somerville MA (Boston Metro Area). Source: Building BOS. July 2014.

3.4. West Dublin-Pleasanton Station – San Francisco Bay Area

When the San Francisco Bay Area Rapid Transit (BART) system was extended eastward in 1997, the planned station at West Dublin-Pleasanton was postponed due to a funding shortfall. However, the station foundation was laid and some train control and communication facilities were left ready for the station's eventual construction. The station finally opened in 2011. In 2016, the four trains per hour serving the station attracted an average of 3566 weekday riders, resulting in the station ranking 40th among BART's 46 stations.

The above-ground station is located in the median of I-580 near the junction with I-680 in a low density, suburban section of the East Bay. The station is served by several bus routes, but a major share of its ridership comes from the nearly 1200 park and ride spaces that BART provides. These parking spaces combined with those of the nearby Stoneridge Mall dominate the landscape around the station. Footbridges connect the station to the parking and local land uses.

The station cost approximately $106 million to build. Of this amount, $20 million was provided by private developers in exchange for the right to build transit-oriented development at the site. The rest came from public funds (Cabanatuan 2011.)

Development underway around the station includes software companies, hotels, and residential development, including affordable housing (Bing 2017, Ruggiero 2017.) Property and sales tax revenue have increased significantly in the area since the station opened, 32% and 56% respectively. However, it is unlikely that this can be ascribed to the station, since both metrics were increasing throughout much of the region.

Figure 8. Overhead View of West Dublin-Pleasanton Station. Source: Streetsblog USA.

Figure 9. Pedestrian Bridge Connecting Station to Nearby Land Uses - West Dublin Pleasanton Station. Source: Architect

Figure 10. West Dublin Pleasanton Development Plan showing pedestrian connections. Source: BART

4. Case Study: Shinn Station, Fremont, CA as a Possible Bay Area Infill Station

Recently a proposal has been made to add a station in the Shinn Station area of Fremont, CA, on the BART line, with linkages to other rail and bus services. We apply the findings from the literature and the cases reviewed in the previous sections to develop an outline of the potential benefits and costs of this infill station.

4.1. Background

In 1960, the nine county San Francisco Bay Area was a multinucleated region of 3.6 million encompassing San Francisco, San Jose, and Oakland as well as numerous smaller cities and towns interlaced with farms, ranches, orchards and vineyards. By 2010 the area's population had nearly doubled, to just under 7.2 million, and by 2018 it had grown to 7.7 million. The economic region and commute shed was no longer encompassed by nine counties but had become a megaregion of 12-14 million people, 21 counties and 164 cities, extending east to Sacramento and the northern San Joaquin valley and south into the Monterey Bay Area. While the core region is one of the most prosperous in the world, traffic congestion, jobs-housing imbalance, and housing affordability are serious problems. Increasingly commuters search for housing they can afford far away from work. A recent study (Bay Area Council, 2016) reported that some 175,000 employees commute into the Bay Area from communities outside its boundaries, a number that has continued to grow. Most of these commutes take place on a limited number of transport facilities that thread their way through coastal mountain ranges. The result is severe congestion and a growing share of commutes that take hours.

Heavy and light rail, bus, ferry, and private bus services are available in the Bay Area, and Amtrak and Atamont Corridor Express (ACE) trains provide interregional connections that are increasingly used by commuters. However, transit agencies in the region are primarily organized on a county basis and provide a limited number of routes serving job centers in other counties. Even BART, the region's most extensive multi-county rail system, serves only a subset of the region. Intercity rail systems (AMTRAK, ACE), which increasingly carry long distance commuters, share track with freight and can offer only a limited number of runs. With the de facto expansion of regional boundaries, there is an increasing recognition of the need for megaregion-wide coordinated transit investment; but the strong tradition of local control does not make implementation easy or quick.

Today, many of the region's rail systems are crowded, buses are often caught in traffic, and ACE and Amtrak services, which operate on track owned by freight rail operators, can offer a limited number of daily runs – ACE can run four trains each direction. Many studies have been carried out on ways to improve conditions; among the possibilities are more passenger rail extensions, new freight rail lines, upgrades to existing services to increase capacity and speed, increased bus service coverage and hours of operation, BRT and other bus priority treatments, employer shuttles and new mobility services, more sophisticated multimodal schedule coordination, improved bike and pedestrian links to transit, and even automated shuttles and buses. Land use strategies such as transit-oriented development are also on the table as a way to increase accessibility and improve jobs-housing balance and housing affordability. However, a number of gaps in service persist and high costs and disagreements about which strategies to pursue have slowed action. Infill stations are among the many proposals competing for attention and funding.

4.2. The Shinn Station Proposal

Fremont has grown from a collection of small towns in the 1950s to the fourth largest city in the increasingly multinucleated San Francisco Bay Area, with a population of about 230,000. Located in East Bay at the edge of Silicon Valley, much of the city's older development is low density suburban style, dominated by single family homes and single-story commercial buildings. However, since the 1990s numerous mid-density, midrise apartments, condos and office buildings have been added, and today the city is home to tech businesses as well as tech workers who commute to San Jose, Santa Clara, Palo Alto, Menlo Park, and other Silicon Valley job centers.

It is in this context that the Fremont Shinn Station is being proposed. While most of the discussion to date has been about connecting BART to ACE trains in the Shinn area, a number of factors will affect the design options.

4.3. Intermodal Connection Possibilities:

Fremont has two BART stations (Fremont and Warm Springs) at the current southern end of BART's North-South Red line; an Irvington station, between the two, is planned. Ridership is modest, with average daily boardings in 2016 of 6,531 at the Fremont BART station and 3,042 at Warm Springs. However, ridership is expected to grow as BART extensions to Milpitas, Berryessa, Alum Rock, Diridon, Downtown San Jose, and Santa Clara/Caltrain stations in Santa Clara County are opened. Fremont also has commuter rail service from the Altamont Corridor Express; ACE operates on an 86 mi. line with 10 stops from Stockton in the Central Valley through the East Bay cities of Livermore and Pleasanton to Fremont's Centerville Station, continuing to San Jose. The Centerville station, which is also served by Amtrak, is about two miles from Fremont BART and is connected by a free shuttle bus as well as by AC Transit bus service.

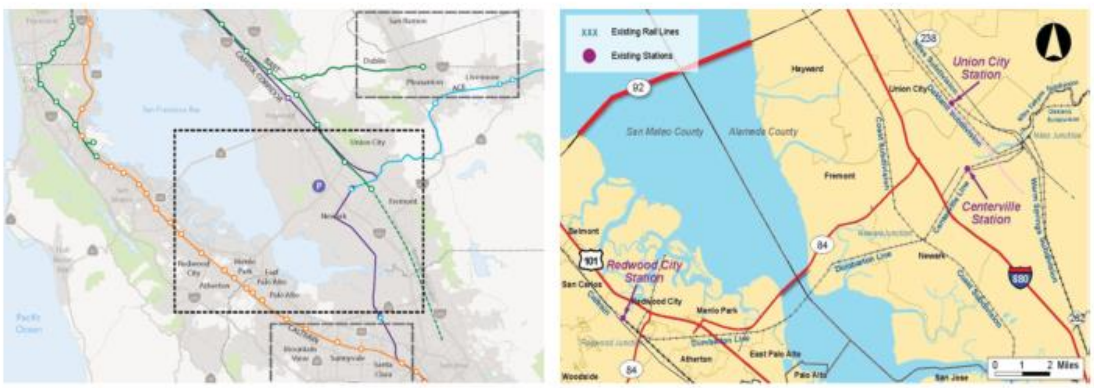
Because ACE currently runs only four trains a day (inbound in the morning, outbound in the afternoon), ridership is constrained. Absent major new investments, growth is anticipated to be limited to that which can be generated through trainset, track, and tunnel improvements, perhaps growing from the current 4900 passengers a day to 6,000-10,000 passengers a day in the 2025-2040 period (AECOM 2017). The State Rail Plan calls for substantial increases in service, to half hour service throughout the day, and this would support large increases in ridership. However, achieving this will be costly and will not happen quickly; it will require improvements in freight connections elsewhere in the region so that pressures on the shared line are alleviated.

Other transit improvements under consideration could increase the benefits of a Shinn station. One proposal is to significantly improve transbay transit in the congested Dumbarton Bridge corridor, connecting Fremont to the Menlo Park-Palo Alto area of Silicon Valley, Currently, most of the trips across the bridge are relatively short (only about 2% are from the Central Valley) with only 4400 daily trips by bus. This could change if access were not so constrained. A 2017 study showed that a combination of "enhanced" bus with express lanes and a rail connection between the Peninsula and the East Bay could result in daily corridor ridership of as much as 33,000-35,000 by 2040. Diagrams showed a potential linkage to BART and ACE in the Shinn area (CDM Smith 2017.) The capital costs of such improvements were estimated to be very high, however – in the $2-2.4 billion range.

A feasibility study is assessing a new route to the Bay Area that would use former Southern Pacific railroad right of way now in public ownership. One scenario would be for trains to first link the Central Valley to Pleasanton via this route, and potentially extend further westward to the Union City station north of Fremont in a later phase. Union City BART currently serves only 4700 riders an average weekday, but ridership is expected to increase once a pedestrian bridge connects the station to mid-density midrise housing and commercial development being built to the East. At present neither ridership forecasts nor cost estimates have been made public for this alternative, which being conducted in response to Senate Bill 758 (2017). The feasibility report should be released some time in summer or fall of 2019. If successful, this train would take the pressure off the ACE lines heading to Fremont and San Jose and provide an alternate route to Union City and thence to Fremont and points South and East. Such a routing could reduce the demand for a Shinn Station somewhat.

Still another option under consideration would reroute Amtrak trains through Newark. This too could reduce the benefit of a Shinn station somewhat, although current Amtrak ridership and transfers at the Centerville station are very modest.

Dumbarton Transportation Corridor Study:
Study Area; Rail Infrastructure



Source: CDM Smith, 2017

Source: http://www.tillier.net/caltrain_maps/26-TCCM-200-B.pdf, 2016

4.4. Land Use Possibilities

While additional transit capacity is a key way to increase ridership, another way to do so is through transit-supportive land use. Thus, another strategy to support a Shinn station would be to increase the amount of transit-oriented development in the area around the station. The Fremont and Union City BART stations are about 3.7 miles apart; an infill Shinn station most likely would be less than a mile from the Fremont BART station. Urban rail transit stations are sometimes that close together, though most BART stations are more widely spaced. But the Shinn area is currently dominated by single family houses, low-rise commercial enterprises, and recreational facilities including Quarry Lakes to the immediate north. Regional forecasts anticipate increases in population and employment density in the subarea over the next decades, but community interest in intensifying development within walking distance of a Shinn station remains to be confirmed.

An immediate opportunity is available with the recent sale of a former industrial site in the Shinn area to a developer with a positive track record in transit-oriented development. The 25-acre site could be developed for industrial uses, but mid- to high-density housing is also in demand and would be a possibility if access issues can be resolved. Currently only Shinn Street crosses the tracks on which ACE operates to reach the site. For housing to be developed, either more street access to the site would have to be built or rail services would have to be reconfigured so that crossing the tracks is no longer an issue. A TOD on this site could help support a station by generating as many as several thousand riders, in addition to those who could come from the existing community. The impact of such a development on the existing community would, however, have to be carefully reviewed.

Other development possibilities may be available on nearby sites owned by the county and by a private trust. Also, while much of the development near the station is currently single-family housing, there are commercial properties within a half mile, 10 min. walk that also could be redeveloped to more intensive uses. Whether there is interest in such development and community support for it in the Shinn area would need to be explored, but it is possible that with redevelopment and intensification of selected properties in the area of a Shinn station, sufficient ridership could be generated to justify a BART station even if the intermodal connections are limited or are focused elsewhere.

4.5. Station Design Considerations

The cost to construct a BART station can run $100-150 million, varying widely with specifics. At the Shinn location BART runs on elevated tracks so an infill station would also be elevated. While a multimodal station in a single large structure would be a possibility, the costs of such a station would likely be very high. An alternative that is likely to be less costly would be to build a BART station and link it to a simple ACE stop, connected to the BART station by a pedestrian overpass. Such an ACE station might cost $30-50 million to construct.

Schedules could be coordinated so that BART trains stop at the infill station only when an ACE train would be met. If ACE train frequency can be increased substantially in the future, or other changes occur that substantially increase demand at the station, then BART could also increase its stops at the station.

4.6. Assessment Criteria

An infill station at Shinn would likely require approval by both the BART Board and the Metropolitan Transportation Commission, as well as local authorities and those providing connections (e.g., ACE), or property and/or funding (potentially, the county.) Given the demands for investment in state of good repair and station renovation projects in many locations, and the need to increase BART access to San Francisco, the BART Board puts heavy emphasis on cost-effectiveness in determining where to make investments. BART considers station ridership below 5,000 average daily trips to be low and would look for plans that authorize transit-supportive development and local projects that provide good local connections (pedestrian, bicycle) to increase ridership. BART also would look for strong community support and most likely would look for cost-sharing to help fund an infill station.

Regional policies under Plan Bay Area also call for a strong benefit-cost ratio for projects, with assessments considering travel time, travel time reliability, travel cost, air pollution, collisions, noise, health benefits; level of support for communities of concern, and environmental benefits, especially with regard to greenhouse gases, air toxics and PM exposures. A Shinn station project would need to be evaluated using these criteria.

Figure 11. Source: CDM Smith, 2017

5. Summary and Conclusions

To sum up, infill stations have the potential to improve access for residents, workers, and other travelers, and depending on station connections and design, may improve transfers. Existing activity centers and neighborhoods may be strengthened by the increased accessibility an infill station provides, and new housing and economic development opportunities around infill stations can be substantial if the station site and larger catchment area from which the station draws (up to a mile or two from the station) is ripe for development and local government policies and community members support transit-supportive growth.

However, if stations are already close together or demand is limited, an added station may not attract more riders, merely altering the mode or station current transit riders use. This may still be of substantial value if it relieves crowding or parking shortages at other stations, but may be a costly way to accomplish this.

Infill stations can costly and may not achieve desired ridership or development objectives if conditions are problematic. Barriers such as freeways or bodies of water can reduce access to the station site. Local land use policies can be impediments to development, as can site-specific conditions ranging from high land costs to incompatible nearby uses. Economic opportunities can be limited if there is community opposition, which can arise due to station- or TOD-related traffic, noise, visual impact, or gentrification and displacement. Uncertainties about community support, or a long, drawn-out public decision process, may itself limit interest in investing in the area. Finally, adding a station involves added deceleration, dwell time, and acceleration time, and these impose a small negative impact on existing riders passing through the area which can offset some of the gains for station users. Unless more riders are benefited by the station than would be slowed by it, the net impact may not be positive.

Examples of infill stations in the US are beginning to accumulate and they illustrate the opportunities and concerns that these stations raise. In many cases, attracting new transit ridership is only one factor in the decision to implement an infill station; as the examples from Chicago, Washington, Boston and the Bay Area show, an infill station may be provided to support nascent growth and revitalization, to jumpstart redevelopment, or to alleviate crowding at nearby stations. Design of the station itself and planning for the area around the station can make a significant difference in the station's ridership performance – the larger and more intensive the development in the area around the station, the more likely that station ridership will be high. While some of the station's costs will be incurred early on – especially capital costs – benefits will accumulate over a longer period. Effects also may be felt elsewhere in the system, suggesting that a focus on the project only may miss larger benefits and costs.

In the Shinn Station proposal, an infill BART station along the BART line between the Union City and Fremont stations would link to an infill ACE stop. Currently, the area is largely one of single-family homes and low-rise businesses. Quarry Lakes form one border of the area. The area is undergoing considerable change as technology businesses and developers increasingly locate there. Congestion is a serious concern and numerous plans to increase transit connections across and service levels are under consideration but decisions have not yet been finalized for most of them. Potential for transit-oriented development in the area is real, with a large parcel ready for redevelopment, but access would need to be improved fairly quickly. Community support for such changes would have to be assessed.

A system-wide analysis is feasible with today's analysis methods and data and will provide a more complete picture of the performance of the various options under consideration. An examination of the costs and benefits of the infill station in this larger context need not be excessively time consuming or costly, and linking decisions on the many transit proposals currently under consideration could lead to far more cost-effective and sustainable transportation, land use, and environmental decisions for the Bay Area and its larger megaregion.

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