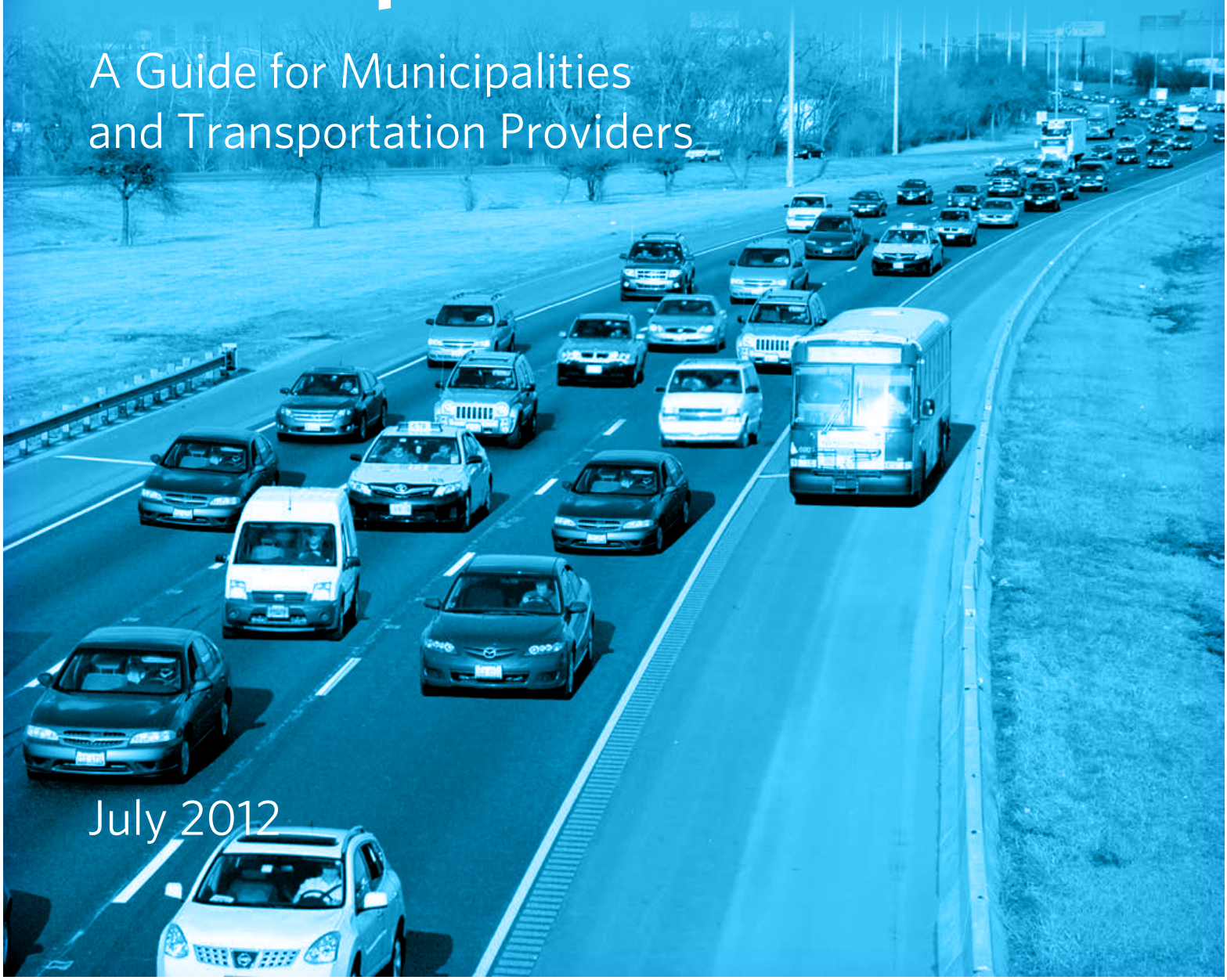
CMAP

Land Use Policies and Strategies for Expressway-Based Bus Rapid Transit

A Guide for Municipalities and Transportation Providers



July 2012

The Chicago Metropolitan Agency for Planning (CMAP) is the region's official comprehensive planning organization. Its GO TO 2040 planning campaign is helping the region's seven counties and 284 communities to implement strategies that address transportation, housing, economic development, open space, the environment, and other quality of life issues. See **www.cmap.illinois.gov** for more information.

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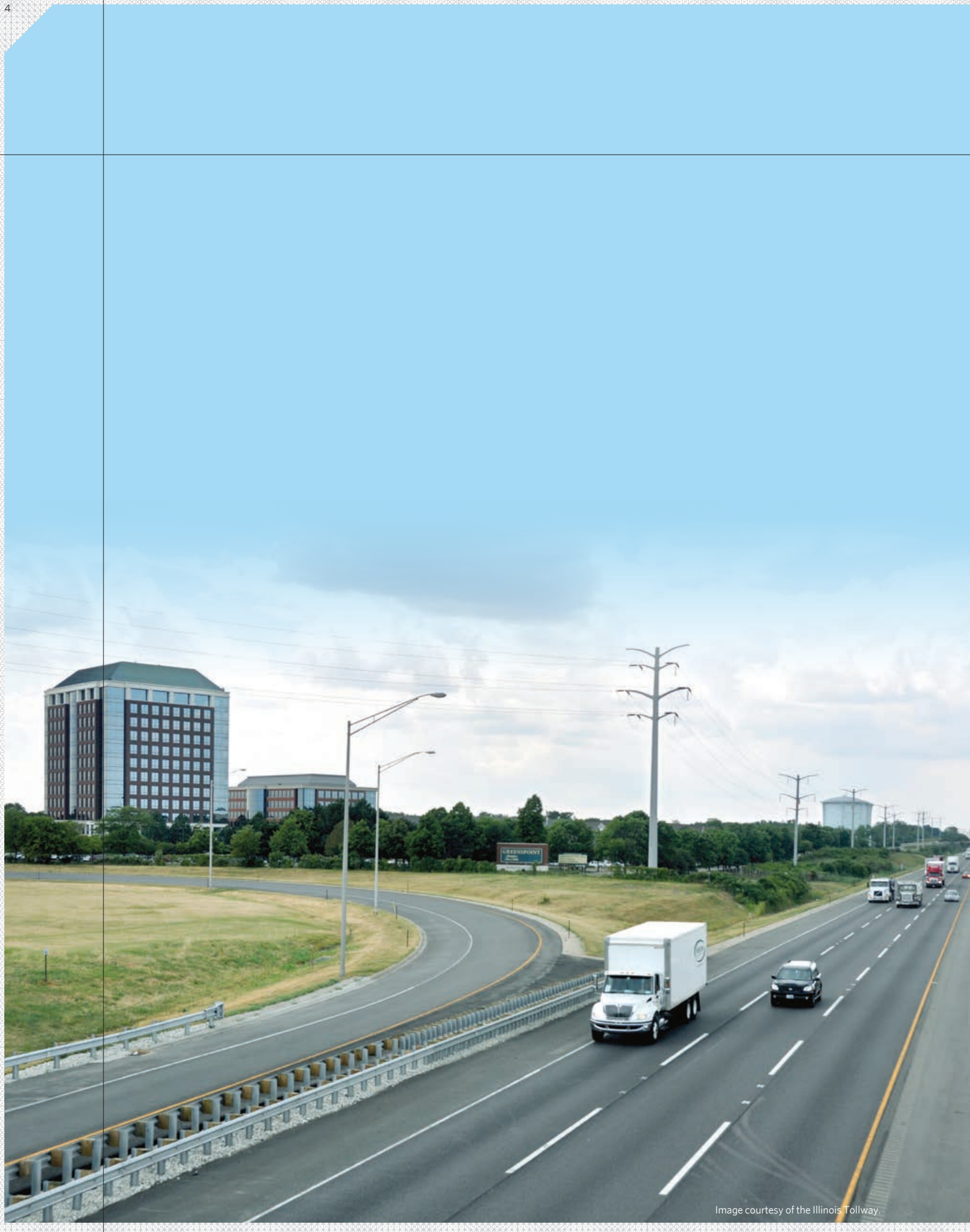


Image courtesy of the Illinois Tollway.

Introduction

Bus Rapid Transit (BRT) has garnered growing recognition as a flexible, cost-effective solution for addressing transit needs and providing a commute alternative in congested areas. Today, the region faces significant mobility challenges as evidenced by increasing congestion, cuts to public transit, and deferred maintenance of critical transportation infrastructure.

To address this, CMAP's GO TO 2040 plan identifies a set of priority transportation projects for the region, with a focus on moving the existing system toward a state of good repair.[1] The set of priority projects also includes two highway extensions and three managed lane/multimodal corridor projects to add capacity to the system, each of which has the potential include transit. Bus-based solutions like BRT are one option to provide transit on these new and upgraded facilities. GO TO 2040 also supports transit oriented development (TOD) and seeks to broaden the definition of transit-supportive land use beyond areas around train stations; in considering transit-supportive land use, the plan specifically recommends planning for supportive land use around expressway-based BRT stations.

This guide offers strategies for municipalities, transit providers, and transportation agencies to use when planning for land use around expressway-based BRT systems. The first section offers an introduction to the potential BRT projects in the region, as well as basics about BRT systems. The second section provides policies and strategies in four functional areas: Station Siting, Planning for BRT-Supportive Land Use in an Expressway Environment, Pedestrian and Bicycle Connectivity, and Marketing and Permanence.

1 Chicago Metropolitan Agency for Planning. *GO TO 2040: Comprehensive Regional Plan*, (Chicago, IL, 2010). Accessed at http://www.cmap.illinois.gov/2040/main.

Expressway-Based Bus Rapid Transit in the Chicago Region

Definitions of a BRT system vary.[2] The Federal Transit Administration (FTA) offers the most basic definition, defining BRT as "an enhanced bus system that operates on bus lanes or other transitways in order to combine the flexibility of buses with the efficiency of rail."[3] Other proponents argue that a BRT system must incorporate separate running ways, Intelligent Transportation System (ITS) components, and unique vehicles and branding to be a true BRT system. Most recently, the Institute for Transportation and Development Policy proposed a rating system for BRT networks,[4] with categories evaluating service planning, infrastructure, station design and station-bus interface, quality of service and passenger information systems, and integration and access. All BRT systems operate at a higher frequency and speed than regular bus service.

Forms of BRT are currently being tested or evaluated for both existing and proposed expressways within the region. Though they tend to fall within the "express bus" end of the BRT spectrum, each has the potential to provide a BRT-like service over the long term.

While the I-55 Bus on Shoulder example is part of a traditional radial transit service that runs between a suburban area and a regional central business district (CBD), the remaining possible expressway BRT corridors in the region would primarily serve both suburban origins and destinations. Suburb-to-suburb transit trips provide a unique transportation planning problem because employment centers and major anchors are often dispersed along arterials with fewer distinct destinations, low employment densities, and higher relative congestion levels. Plentiful and free parking also incentivizes automotive travel over transit. This reality makes provision of transit services that are competitive with travel in an automobile difficult. Institution of policies and strategies to facilitate more transit-supportive land use patterns is required to best support any new BRT system.

I-55 Bus on Shoulder

On November 7, 2011, Pace began a two-year Bus on Shoulder demonstration project on I-55 between Plainfield and Chicago, with destinations downtown, at the University of Illinois at Chicago, and in the Illinois Medical District. In the spectrum of BRT typologies, this service is best described as an express bus. The demonstration is an interagency pilot project that includes Pace, the Illinois Department of Transportation (IDOT), the Regional Transportation Authority (RTA), and the Illinois State Police. An evaluation of the program will be completed during its second year, but preliminary figures indicate that the project has increased on-time performance from 68 percent to 92 percent and has increased ridership by 67 percent.[5]

I-90 Managed Lanes

The Illinois Tollway and RTA have completed a Transit Value Planning Study[6] for the Jane Addams Memorial Tollway that evaluates options for inclusion of transit within two new managed lanes (one in each direction) that will be added during the reconstruction of the facility. This analysis also includes long term phase-in options for exclusive bus running ways and, potentially, rail. In coordination with the Toll Authority's planned widening and managed lanes project, Pace is developing implementation plans to serve various new and expanded markets in the I-90 corridor. Pace plans to begin incremental expansion of service in 2013 in response to market demand, and options include new, expanded express-bus service, marketing, call-in-rides, new transit vehicles, and construction of new park n ride lots and transit priority access ramps.

Proposed Highway Extensions

The proposed Elgin-O'Hare Expressway Extension and West Bypass and the Central Lake County Corridor (extension of Route 53 and bypass for Route 120) have the potential to include BRT or express bus as a transit option. The Elgin-O'Hare extension and West O'Hare Bypass project is in Tier II of the federal National Environmental Policy Act (NEPA) process and assumes set-aside of right–of-way for future transit options. While these transit options have not been fully analyzed, BRT is one option to provide service on the corridor.

The Central Lake County Corridor is in the early evaluation stages, but the Tollway's Illinois Route 53/120 Blue Ribbon Advisory Council has indicated that encouraging transit is a key goal of the proposed roadway. Preliminary discussions indicate that express bus is the most likely near-term transit option for the corridor.

2 Weinstock et al. *Recapturing Global Leadership in Bus Rapid Transit: A Survey of Select U.S. Cities. 2011.* Institute for Transportation & Development Policy.

3 "Bus Rapid Transit," Federal Transit Administration, Accessed January 19, 2011 at http://fta.dot.gov/about/12351_4240.html

4 Weinstock et al. (2011).

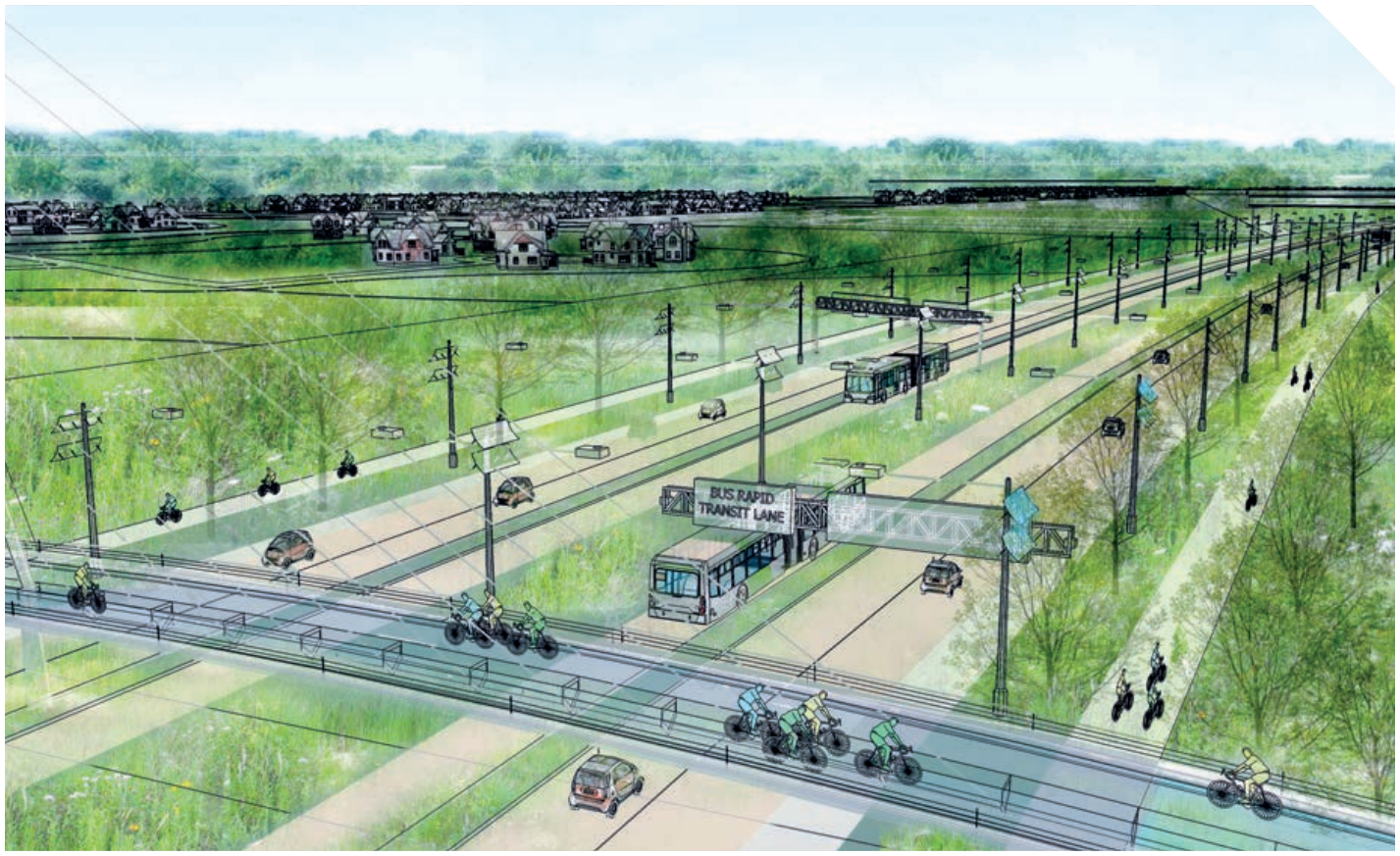
5 Pace, Press Release: "Pace Adds Service to I-55 Express Routes Effective April 9," Accessed on April 24th, 2012 at http://www.pacebus.com/sub/news_events/press_release_detail.asp?ReleaseID=594.

6. The Value Planning Study and other documents related to the work of the I-90 Corridor Planning Council area available on the Tollway's website at http://www.illinoistollway.com/construction-and-planning/community-outreach/i-90-corridor-planning-council.

Figure 1. Pace Bus on Shoulder demonstration project

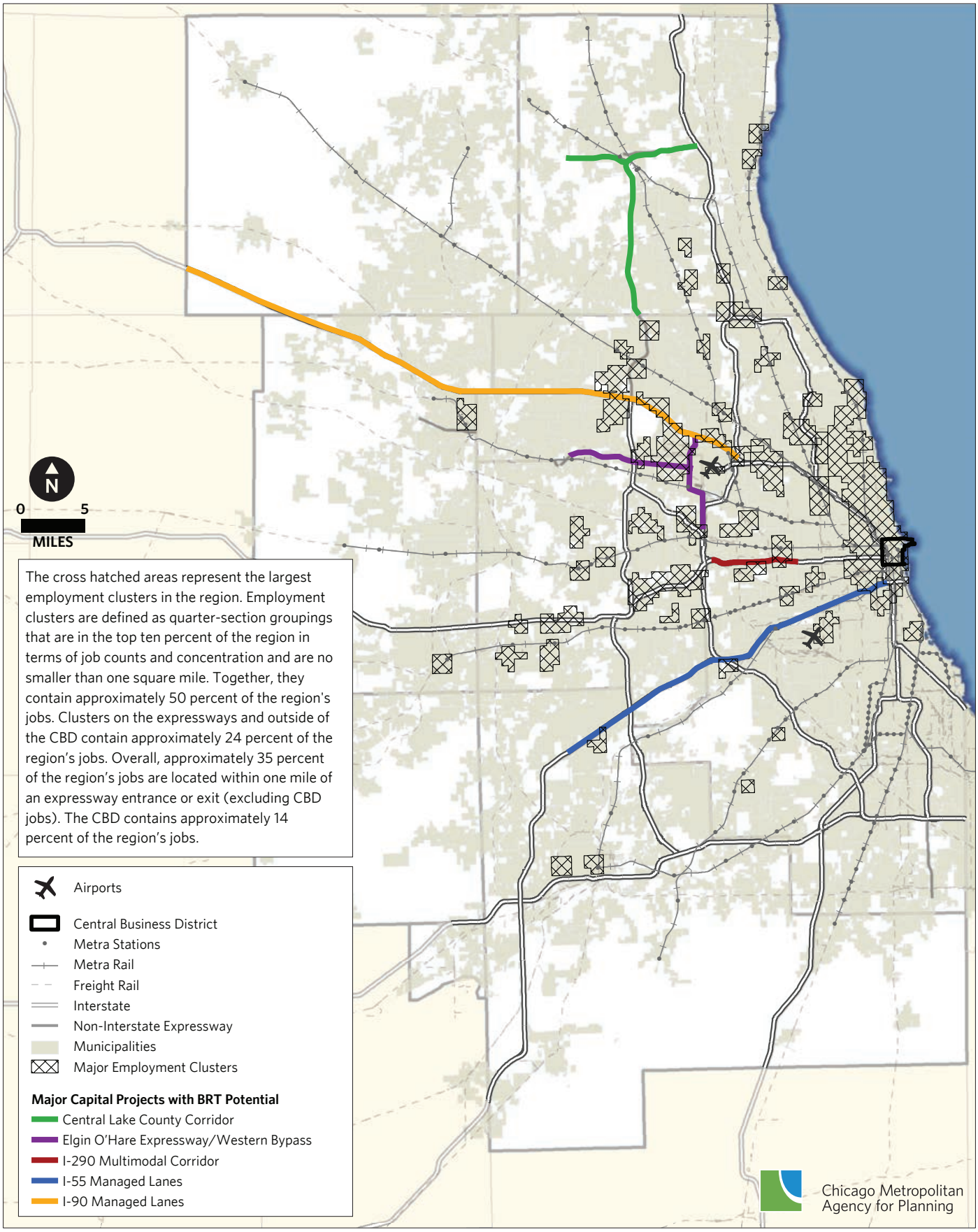
Pace initiated the two-year, I-55 Bus on Shoulder demonstration project in November of 2011. The initiative has proved successful, and additional service was added in March 2012. Source: Pace.

Figure 2. Central Lake County Corridor vision from GO TO 2040



GO TO 2040 envisioned the Central Lake County Corridor as a 21st Century highway with slower speeds, fewer lanes, environmental innovations, and bus or multimodal lanes. The Illinois Route 53/120 Blue Ribbon Advisory Council's vision maintains accommodation for enhanced bus service through wide shoulders and space reserved in the median for future bus or multimodal lanes. Source: Chicago Metropolitan Agency for Planning.

Figure 3. CMAP region employment clusters and select major capital projects



Sources: CMAP Analysis of Illinois Department of Employment Security data, 2010.

The Basics of BRT and TOD

The purpose of transit-oriented land use is to concentrate housing and commercial development close to transit infrastructure, thereby providing an alternative to automobile trips. Most TOD development radiates roughly a half mile — or less than ten minutes walking distance — from its anchoring transit station. The principles of supportive land use for bus-based transit systems are generally considered to be the same as the TOD utilized for rail stations. However, the creation of bus-based TOD can face larger obstacles due to a negative perception of bus systems, a perceived lack of permanence of bus improvements, and the auto-orientation of bus station areas. These problems are compounded in an expressway-oriented environment and lead to significant land use and design challenges: the physical divide created by an expressway makes pedestrian access to stations difficult; new development often turns away from the noise and traffic of the expressway, limiting access to expressway-based stations; employment centers are rarely proximate to highway interchanges; and, the overall densities on these corridors are often lower than that required to support walkability and transit.

On the other hand, expressways have the potential to provide access to many employment centers in the region. The map on page 8 overlays the region's employment clusters on our existing and proposed expressway system. As of 2009, approximately 14 percent of the region's jobs were located within the 3.7 square mile CBD in downtown Chicago. Approximately 24 percent of the region's jobs are located in expressway-based employment clusters outside of the CBD, touching approximately 75 miles of interstates and expressways. Region-wide, there are approximately 470 miles of interstates and local expressways, and nearly 35 percent of all jobs (excluding the CBD) are located within one mile of an expressway entrance or exit. While the distances involved and the less-concentrated nature of development in expressway areas present a challenge to providing transit services, delivering transit in these areas could provide much stronger reverse commute and suburb-to-suburb commute options.

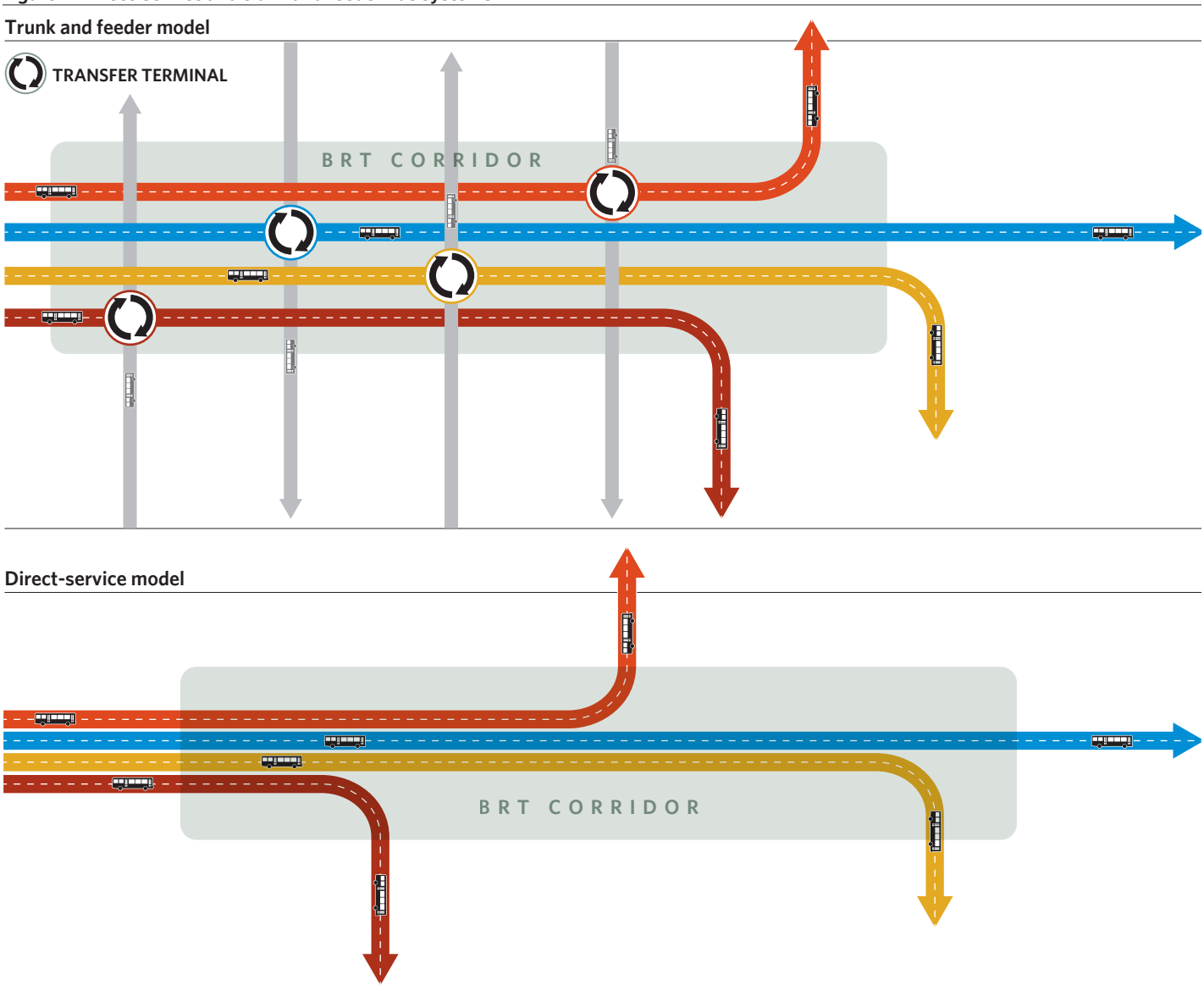
Studies indicate that transit connections to employment centers throughout a region, rather than just downtown, are critical to encouraging transit commuters. A recent review of literature by the Center for Transit-Oriented Development (CTOD) indicated that transit lines with higher employment counts near transit stations have higher ridership and that employment centers with larger total employment counts and higher employment concentrations generate the highest ridership levels.[7] Institution of land use policies that encourage employment and housing clusters near BRT transit stations and promote integration of transit into development can facilitate a transition toward transit-supportive development patterns in employment corridors. To support this land use transition, planning of BRT services and stations in these corridors must consider not only transit running times and easily available right of way, but also the potential to encourage transit-supportive development in key locations

7 Center for Transit-Oriented Development. "Transit-Oriented Development (TOD) and Employment" 2011. Accessed May 3, 2012 at http://ctod.org/pdfs/2011TOD-Employment.pdf.

There are two distinct types of BRT service which may be utilized in the region, and each has different implications for potential land use impacts and supportive land use policies. The first and most common type of BRT system is a "trunk and feeder" model, wherein local bus routes connect to a BRT route on a highway, exclusive busway or major arterial and a transfer is required to access the BRT line. This type of line acts similarly to a fixed rail line. These stations have the potential to serve as an intersection of multiple transportation modes, and that concentration of activities can often support a denser residential or commercial node that both depends upon and supports the transit services. However, expressway-adjacent stations also exist in very auto-oriented areas and creation of true TOD can be challenging. In these situations, careful siting of stations and redevelopment planning will be required to foster transit-supportive land uses.

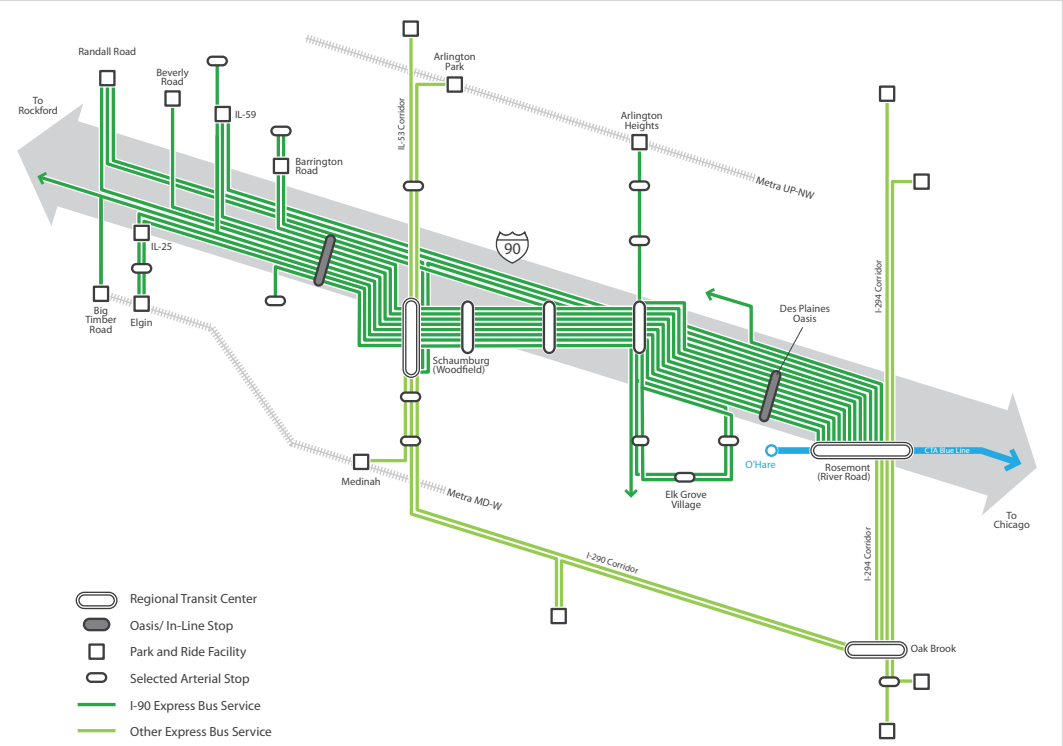
In contrast, a "direct-service" model allows bus or BRT lines to access the expressway BRT improvements for portions of their route and return to arterials to access key destinations that are not located near the expressway. Major arterials may also have select BRT improvements. This model takes advantage of the flexible routing of BRT systems, has the potential to provide a single seat ride and may address the "last mile" problem for riders whose destinations are more distant from the expressway. However, the transit service may be slower because the destinations on a direct-service line may be less concentrated and located on highly congested corridors where it is difficult for the bus to provide a faster commute than the automobile. This report focuses on expressway-adjacent stations which are more typical of the trunk-and-feeder model.

Figure 4. Direct-service and trunk and feeder bus systems



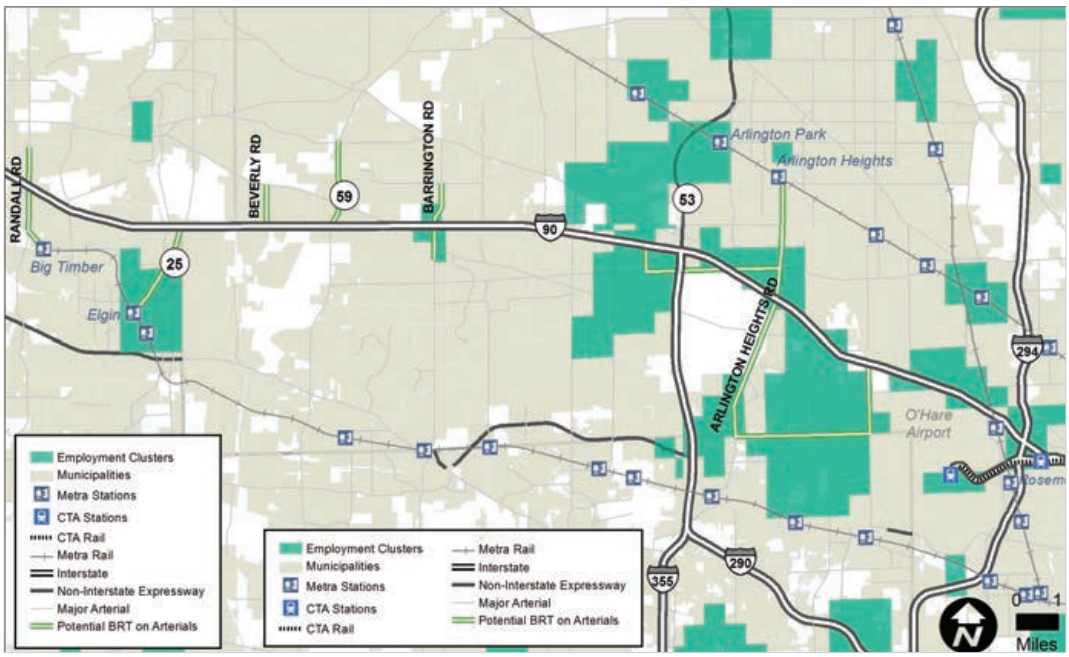
Source: Chicago Metropolitan Agency for Planning.

Figure 5. Transit service and employment clusters on the I-90 corridor



This diagram shows one proposed service concept for I-90. This concept is a direct-service model, where buses would only use I-90 for a portion of their trip. They will divert to arterials where necessary to serve major employment centers like the Golf Road Corridor. In this concept, buses on the expressway will use multimodal lanes that give buses a speed advantage compared to regular traffic. Arterials may also have bus signal priority and other improvements to improve transit travel times.

Source: Illinois Tollway.



The potential BRT arterials routes represent approximations of the service concept above. The green areas represent the largest employment clusters in the region. Employment clusters were defined as quartersection groupings that are in the top ten percent of the region in terms of job counts and concentration and are no smaller than one square mile. Together, they contain approximately 50 percent of the region's jobs. A number of other clusters exist beyond the extent of this map.

Source: Chicago Metropolitan Agency for Planning.

Figure 6. Matrix of supportive land use strategies

TRANSIT AGENCIES ROADWAY AGENCIES MUNICIPALITIES PRIVATE DEVELOPERS

STRATEGY	IMPLEMENTER	BRT IMPLEMENTATION STAGE				PAGE
		PLANNING	ENGINEERING/ DESIGN	CONSTRUCTION	OPERATIONS	
Station Siting						15
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Define the TOD Area						22
Create a Station Area Plan						22
Align the Zoning Code						23
Provide Design Guidelines						25
Establish Regulatory Incentives						25
Create a Strong Development Climate						25
Pedestrian & Bicycle Connectivity						27
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Supportive Land Use Guide

The supportive land use guide provides policies and strategies to assist municipalities and transportation providers in planning for supportive land use for BRT and express-bus systems. The region already has significant resources and examples regarding planning for and implementing TOD, and this guide seeks to outline the ways that traditional TOD strategies might differ for expressway-based transit systems.

The recommendations are organized into four functional areas:

1) **Station Siting**
   This section focuses on strategies for station placement to minimize the negative externalities of the expressway and increase the potential for TOD.

2) **Planning for and Implementing TOD in an Expressway Environment**
   A number of traditional TOD strategies are reviewed, with a particular emphasis on how they might be utilized to create TOD in a traditionally auto-oriented environment.

3) **Pedestrian and Bicycle Connectivity**
   Ensuring connectivity is a core tenet of TOD strategies and emerged as an especially critical strategy for the expressway environment. This section provides traditional and expressway-specific strategies.

4) **Marketing and Permanence**
   This section provides strategies to address the negative perceptions that BRT and bus systems face related to the quality of service, the permanence of bus systems, and the ability of bus stations to generate development interest.

The matrix on the facing page outlines each of the tools under these functional areas, indicates what implementers are responsible and estimates when in the BRT implementation process the tools and strategies should be utilized. As this matrix indicates, the region's proposed expressway-based BRT systems will require strong, ongoing partnerships between many key stakeholders to plan, fund, build, operate, and maintain. The recommendations of this guide can only succeed with these partnerships in place. While detailed recommendations on the structure of these partnerships are beyond the scope of this guide, similar partnerships are highlighted in both this guide and its companion technical document which can be found at **www.cmap.illinois.gov/brt**.

Image courtesy of the Illinois Tollway.

Station Siting

Placement of an expressway-based BRT station is one of the most critical factors influencing the potential of a station to attract supportive land use. Expressways present a large physical barrier for automobiles, transit, pedestrians, and bicycles. Additionally, traffic produces noise and air quality impacts, which can make inline and adjacent stations inhospitable for transit riders. However, station placement must balance these concerns with the need to minimize the trip time increases that diversions from the expressway can cause. While the CMAP region has a strong tradition of in-line, expressway-based train stations, this arrangement has the least potential to provide a pedestrian-friendly environment in which traditional TOD can occur.

Siting BRT stations outside of the expressway right of way should be considered one of the first and most important tools in encouraging transit-oriented land uses that can best support expressway-based BRT. When placement of stations outside of the expressway is not feasible, other strategies should be used to best connect pedestrians to the station and adjacent developments. The following tools offer station siting considerations to address the negative externalities of the expressway and encourage TOD.

Finally, many of the recommendations in the station siting section involve strategies that can add to project costs. For example, bus-only ramps require additional funds to construct, and off-expressway stations may require the purchase of additional land for station siting. While some of these recommendations may be more costly in the short term, they provide a better building block for encourage supportive land use and better transit over the long term. A number of strategies are available to address these costs, including public-private partnerships, special assessments or business districts, tax increment financing, or cost savings in other project areas.

Figure 7: Prairie Stone Park Aerial

Prairie Stone Park offers one opportunity for expressway-based BRT at a between-interchange station that could also offers direct access to a major job center. Prairie Stone Park is an office, hotel, and retail development located along I-90 in Hoffman Estates between the Route 59 and Beverly Road interchanges. The park has an existing Pace Transit Center and also has potential land for a new transit center located closer to I-90. Given the size of the park, in intra-park shuttle service will also likely be required to provide a full trip on transit. Source: Chicago Metropolitan Agency for Planning.

Transit Market Analysis

Choosing the location for a transit station can involve many factors beyond the location of major destinations. These include elements such as right-of-way availability, routing limitations, and land costs. However, high-level station location decisions should be based on a transit market analysis or other demonstration of transit need. This is particularly important for expressway-based routes that provide suburb-to-suburb connections. A transit market analysis can identify key destinations as well as assess the needs, perceptions, and attitudes of major ridership groups. The market analysis will ensure that stations are located in areas where they have the most potential to increase ridership.

Station Typology Analysis

Potential station areas are often chosen before the exact station site is defined. An analysis of the key attributes of these potential station areas can provide critical information on the opportunities and challenges of each station area, identify which station areas have short or long term TOD potential, provide a template for future development in station areas, and guide specific station siting. Data collected on each station area should include: population, income, employment, employment sectors, other transit services, existing land uses, major anchors, redevelopment sites, and recent land use change. This analysis should be completed before station siting is finalized and may be used to place a station near key redevelopment sites or area anchors. This can serve as an opportunity to align the goals of municipalities and transit agencies. Expressway-based BRT systems will cross many jurisdictions, so success will require coordination on the part of municipalities, transit agencies, and roadway agencies.

Transit Station Typology Analysis in the Region

In 2009, the Chicago Transit Authority (CTA), the City of Chicago, and other area municipalities completed a Transit Friendly Development Guide that included a typology analysis of ten CTA bus stops and all CTA rail stations, including those not within the City of Chicago. This is a unique analysis because it was completed for an existing system rather than a new or planned system, and it focuses on development typologies rather than the general station area. The goals of the typology analysis were to encourage TOD near CTA stations and transit nodes, provide a tool for elected officials and private developers to attract appropriate development to station areas, and identify opportunities for development of CTA- and City-owned properties. Stations were assigned to one of seven typologies based on the long-term plans for the station area rather than current conditions. This incorporates community plans and allows developers to see the desired outcomes for each station area.

Figure 8. Transit station typology analysis in the region

Source: CTA.

Site Stations Outside of the Expressway Right of Way

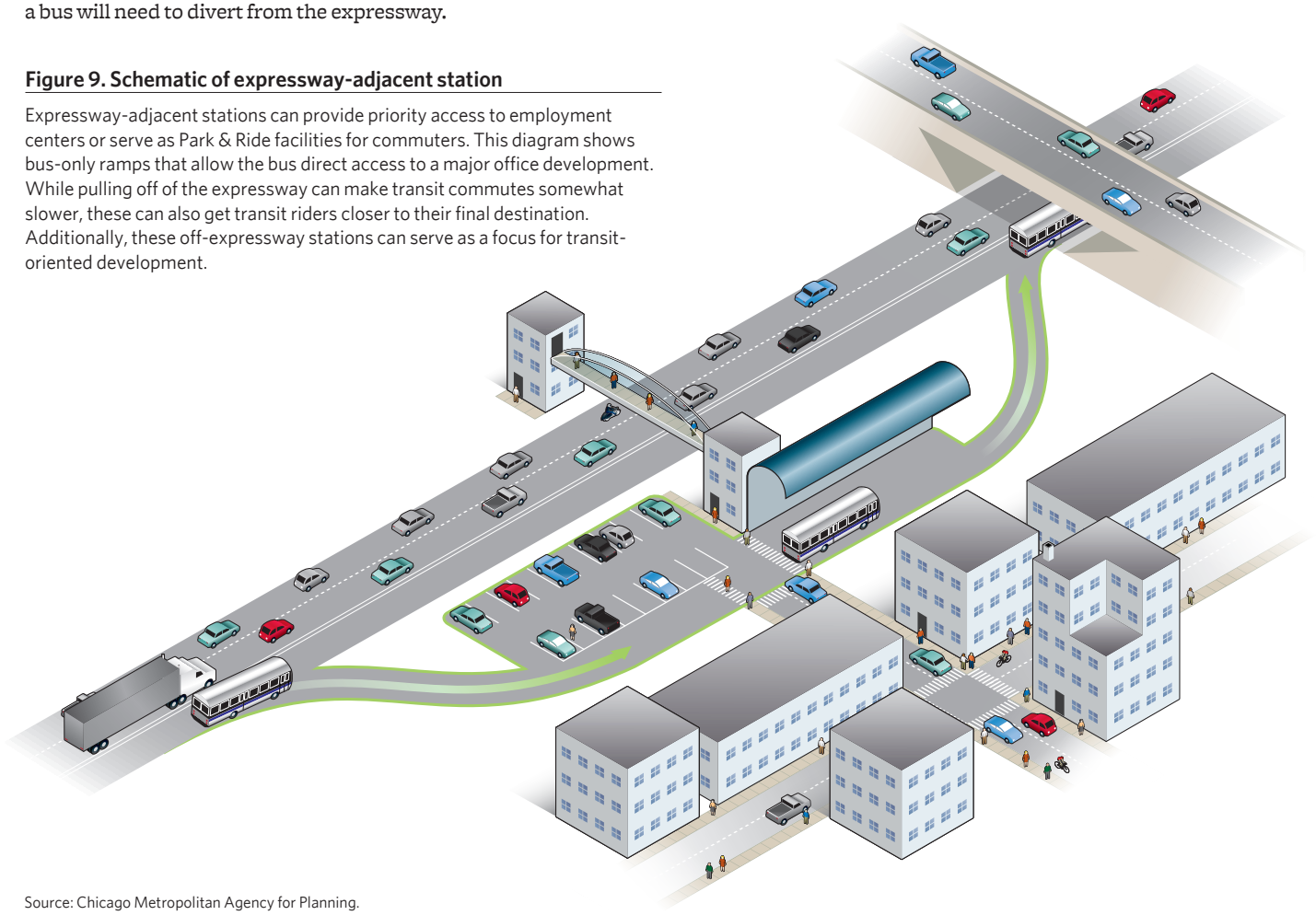
The Chicago region has many expressway-based transit stations, most of which are sited in the center of the expressway and are accessed via a major arterial directly above. While this configuration minimizes land costs, reduces transit service times, and facilitates transfers to arterial bus routes, it offers the least desirable pedestrian and bike access and provides minimal access to adjacent development. Stations sited adjacent to the expressway or offset into adjacent development areas have significantly more potential to serve as a node for development and create a transit-friendly environment. Access from the other side of the expressway should be facilitated with pedestrian amenities on existing roadways or pedestrian bridges. This configuration provides a better opportunity for access to adjacent developments while minimizing the time that a bus will need to divert from the expressway.

Site Stations between Interchanges

Over the long term, siting stations away from interchanges and integrating them with other transit nodes or commercial areas without expressway access may provide one of the best opportunities to support TOD in an expressway context. The Transit Cooperative Research Program (TCRP) report on multimodal corridors recommends this as one of the best strategies to create a transit-supportive environment that is protected from the negative externalities of the automobile.[8] Pedestrian access to the station via pedestrian bridges should be carefully considered to provide the best access to the surrounding neighborhood and nearby development. Auto access to these areas is provided only via local streets, offering the opportunity to create a very pedestrian-oriented district that resembles a more typical TOD area.

Figure 9. Schematic of expressway-adjacent station

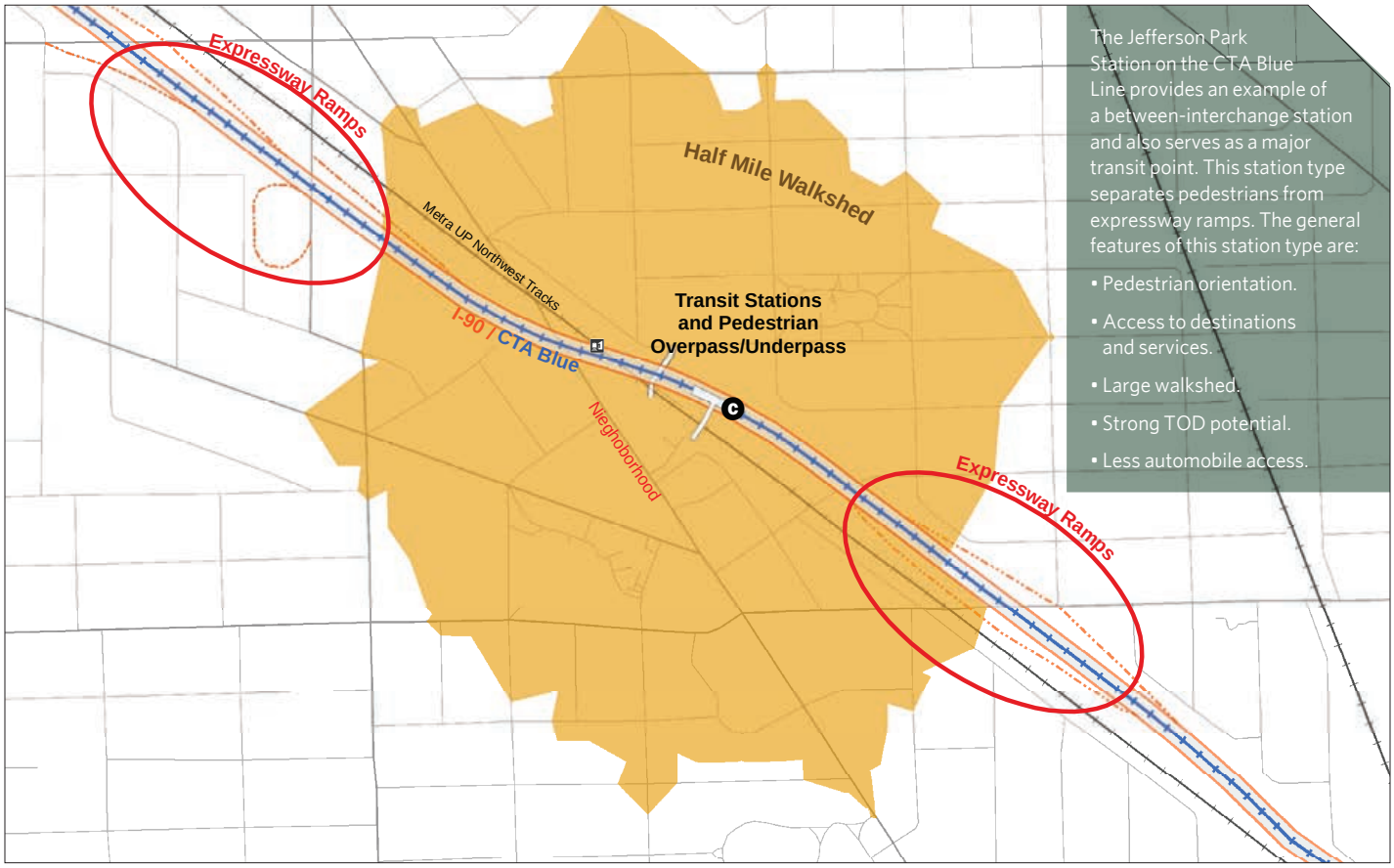
Expressway-adjacent stations can provide priority access to employment centers or serve as Park & Ride facilities for commuters. This diagram shows bus-only ramps that allow the bus direct access to a major office development. While pulling off of the expressway can make transit commutes somewhat slower, these can also get transit riders closer to their final destination. Additionally, these off-expressway stations can serve as a focus for transit-oriented development.

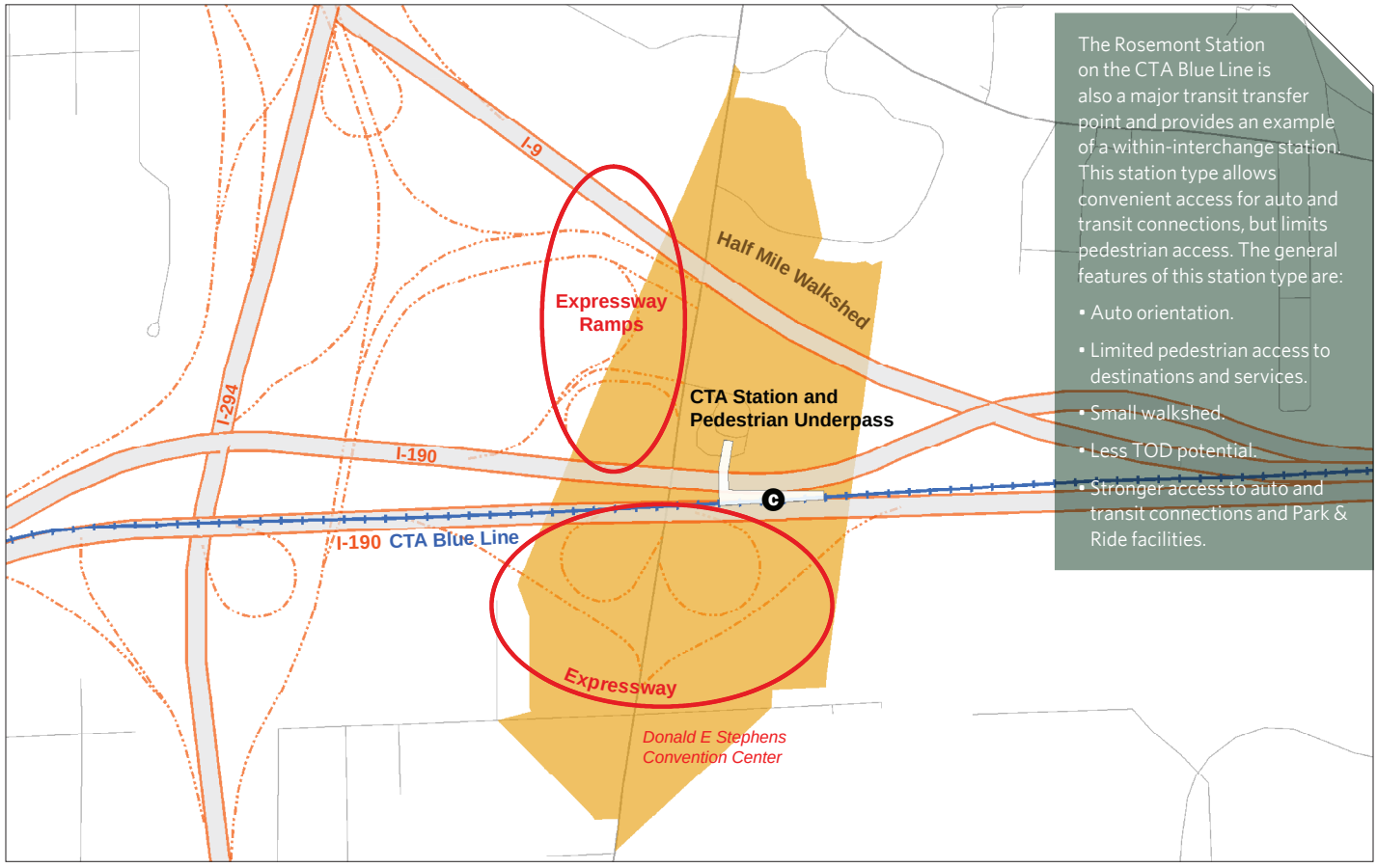


Source: Chicago Metropolitan Agency for Planning.

8 Ferrell et al, *TCRP Report 145: Reinventing the Urban Interstate: A New Paradigm for Multimodal Corridors*, (Washington DC: National Academy Press, 2011).

Figure 10. Impact of expressway interchanges on transit station accessibility





CTA's Jefferson Park station on the Blue Line is placed between interchanges and provides pedestrian bridges to Metra connections and the neighborhood commercial center at Lawrence and Milwaukee Avenues.

Source: Chicago Transit Authority, Transit Friendly Development Guide, accessed on April 24, 2012 at http://tinyurl.com/c2cmzfw.

Site Stations within Major Developments

Where major destinations are adjacent to the expressway, it may be desirable to provide slip ramps to allow buses to divert into these developments. This will facilitate greater transit access to major employment destinations as well as offer more potential for TOD by providing an environment that can be sheltered from the expressway. In turn, these employment centers should have planning completed to encourage a long-term transition to transit-supportive densities and development patterns.

Figure 11. Burr Ridge Village Center

Major developments such as the Burr Ridge Village Center and the surrounding office development offer the opportunity to bring commuters directly to their work or home. Pace currently has a Park & Ride facility near the development, and it serves as on the stops on Route 855, a Bus on Shoulder Demonstration Route. Over the long term, efforts should be made to provide a more centrally-located stop and/or encourage development that is oriented toward the Pace stop. This will provide better pedestrian access between the station and key destinations.

Sources: CMAP and CoStar.

Preserve TOD Potential for Park & Ride or Transfer Stations

Some stations will serve exclusively to provide Park & Ride access and/or transfers to other transit modes. In these cases, it is desirable to locate near an interchange to facilitate the transfer from private autos to expressway-based buses. However, these stations can still be located to preserve a long-term potential for TOD. For example, a Park & Ride can be placed away from an interchange, but direct-access ramps can provide access to bus-only, High-Occupancy Vehicles, or High-Occupancy Toll lanes. If it is desirable to transition a Park & Ride station to TOD over the long term, station siting considerations for TOD should be used. The San Diego example below shows a rendering of a Park & Ride station in an area that is planned for a transition to denser, transit-supportive configurations over the long-term.

Figure 12. Planned Rancho Bernardo Park & Ride in San Diego, CA

This image shows a planned Park & Ride facility along I-15 at the Rancho Bernardo neighborhood of the City of San Diego. This BRT service provides a commuter option for long-haul bus service to downtown San Diego. This area has a large number of campus-style office parks. The station is just north of an interchange and features dedicated ramps to facilitate access to HOV lanes that allow transit, carpools, and those willing to pay a higher toll. A transfer station links BRT services to local transit loops. A pedestrian bridge to the opposite side of the I-15 is under evaluation.

Source: San Diego Association of Governments, presentation "*Managed Lanes in San Diego: HOV, BRT, & Value Pricing*" at **http://tinyurl.com/c6f83od**.

Planning for and Implementing BRT-Supportive Land Use in an Expressway Context

Planning for supportive land use around transit focuses on creating mixed-use districts that provide a rich assortment of service, employment, and housing options. Expressway-based stations face significant barriers to filling the traditional TOD role. However, expressway-based transit has the potential provide a strong, new transit link to employment centers that are located outside of the region's center. In order to assure the long-term viability of these expressway-based transit systems, strategies should be put in place to encourage a transition to transit-supportive uses and forms in transit-served employment centers.

The strategies and tools in this section are not unique to expressway-based transit, but are instead typical strategies to encourage TOD in any environment. The basic strategies to create walkable, transit-supportive places remain the same regardless of the existing land use environment. However, the expressway and adjacent arterials offer unique challenges for creating TOD, and examples and illustrations in this section have been tailored to those environments.

All of the strategies noted in this section are likely to take place over the long term. The built environment changes very slowly, and adapting auto-oriented environments to a more transit-friendly form can take place over many years. While some catalytic redevelopments may create major change in a short period of time, many efforts will involve ongoing, small-scale projects that create a more transit-friendly environment over time. Improvement of express bus services and development of BRT services may similarly happen over a longer period as a transit market and supportive land uses are developed.

Finally, since BRT corridors are multijurisdictional, many of the strategies cited in this section offer an opportunity for communities to work together to encourage supportive land use across the BRT line. Communities can collaborate to formulate consistent station area zoning regulations or corridor design guidelines, can partner with businesses and transportation providers to form an organization that supports transit usage and supportive development on the corridor, and can create policies that facilitate redevelopment.

Coordinate Planning for Stations Areas Across the BRT Corridor

The most-cited examples of successful land use change related to BRT corridors are found in regions or cities (Ottawa, Boston, Pittsburgh) where redevelopment efforts have been coordinated across a transit line rather than on a station-by-station approach. Recent transit expansions in other cities (Denver, Los Angeles, Seattle) have incorporated station typology analyses and other initiatives address land use on a corridor-wide basis. This helps to allocate resources, define priorities over the near and long term, and identify common problems and goals. Since expressway corridors cross many jurisdictions, it is important to work across these boundaries toward land use outcomes that benefit the service as a whole.

Define the TOD Area

In rail transit, a TOD area is traditionally defined as a radius between one-quarter and one-half mile from the station. New studies have sought to better assess this half-mile distance by defining a walkshed, or areas that can be walked to within 10-15 minutes. However, available sites in an expressway environment can exceed these thresholds. For example, the furthest edge of the Westminster Center redevelopment outside Denver, CO, is approximately three-quarters of a mile from the BRT station, and this distance will increase when actual walking paths are taken into account. Therefore, definition of a TOD area in an expressway context should look beyond the traditional half mile and encompass the entirety of major sites or office campuses and/or extend to major roads. Very large potential TOD areas may have to be supplemented by shuttle services or require placement of the BRT station further from the expressway and in a more central part of the development.

Create a Station Area Plan

Creating a station area plan involves significant levels of effort on the part of municipalities, transit agencies, and local stakeholders. When done successfully, it can begin the creation of a new, transit-supportive node in an expressway-dominated environment. Station area plan processes also involve a substantial amount of community education and input, which can serve as an opportunity to promote the proposed BRT system and its benefits. Station area plans should address several key components to assure that they provide a successful blueprint for future development.

Station area plan checklist

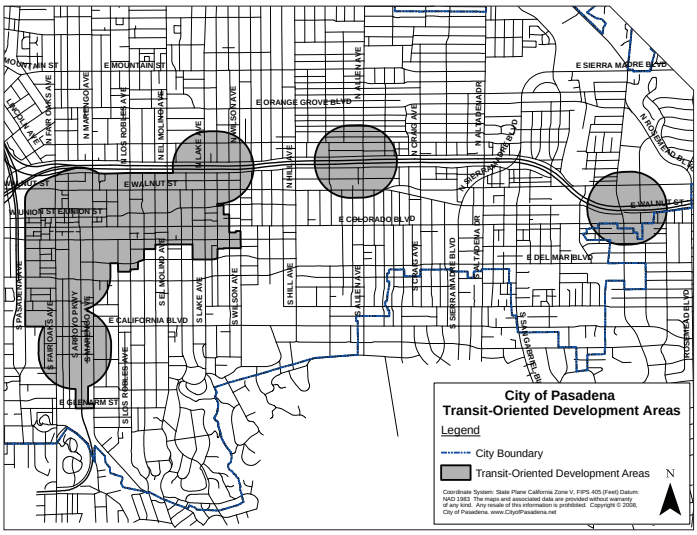
- ☐ **ASSESS EXISTING CONDITIONS:** Information on existing land uses, available sites, population, income, businesses, transit services, and other basic descriptive data should be compiled to provide a basis for analysis. For expressway-based transit, identification of key vacant and underutilized sites will be critical to transitioning to a denser, more human-scale environment.
- ☐ **ANALYZE MARKET POTENTIAL:** TOD cannot be successful if there is not market demand for the planned land uses. A market assessment should be completed for each major desired land use within the station area, with particular attention to the higher densities and more compact form of TOD.
- ☐ **CONSIDER MULTIMODAL ACCESS:** Transit, pedestrian, bicycle, and automobile access should all be considered in creating the station area plan. Key challenges, opportunities, and next steps for each should be identified.
- ☐ **CONSIDER EXISTING ZONING'S EFFECT ON TOD POTENTIAL:** Existing zoning codes should be reviewed to assess their ability to allow transit-supportive development. Key changes should be outlined. In the expressway environment, this is critical to encourage a transition to more transit-supportive land uses configuration.
- ☐ **LOCATE COMMUNITY ANCHORS AND PUBLIC FACILITIES NEAR STATIONS:** The planning process should include a discussion of future needs in terms of public and institutional facilities. Sites for these new facilities should be identified within the station area.
- ☐ **CREATE A FUTURE LAND USE SCENARIO:** The TOD process may involve evaluation of multiple potential land use scenarios for the station area. The final chosen scenario should provide clear direction that reflects market feasibility and community desires and can integrate with the existing community fabric.
- ☐ **PROVIDE IMPLEMENTATION STRATEGIES:** Key actors and short-and long-term tasks should be outlined. The implementation strategy may also include benchmarks and check-in points.

Align the Zoning Code with the Station Area Plan

While station area plans may encourage development of transit-supportive land uses, this is difficult to achieve without matching updates to a municipality's zoning code. Revising zoning codes encourages "as-of-right" development that fits with the goals of the plan and eases regulatory hurdles to development. Any project that fits within existing zoning codes is considered to be buildable as-of-right, and the builder is only required to perform the basic permit applications required of all development. A review of the literature, as well as interviews with local developers, have indicated that adding certainty to the development process and decreasing development timelines by reducing regulatory hurdles is a critical component of encouraging redevelopment. In addition to basic code revisions, several options are available to promote TOD in a more structured way:

- **Form-Based Code** defines the form of a development rather than the uses within it. The focus is the relationship between the building and the public realm, with the goal to facilitate development that predictably enhances community character. Form-based code can also be applied in a select area through an overlay district.
- **Transit Overlay Districts** place additional requirements on areas of a community that meet specific criteria. This district may require higher densities, pedestrian-focused design, less parking, and other transit-supportive elements. An overlay district may be appropriate for areas where several underlying districts overlap or for communities with multiple station areas.
- **Development Typologies and Hybrid Codes** can utilize the requirements of a typical zoning code but incorporate form-based elements to indicate the development expectations of a community. They provide locally-desired examples for developers to work with.

Figure 13. Pasadena, CA TOD areas



The City of Pasadena, CA, has used TOD areas, or overlay districts, extensively to promote TOD near Gold Line light rail stations. Areas within a one-quarter to one-half mile of a transit station must meet higher density, pedestrian amenity, and other design requirements to encourage TOD access.

Source: City of Pasadena, "Transit-Oriented Development Areas", accessed on February 12, 2012 at http://www.cityofpasadena.net/WorkArea/DownloadAsset.aspx?id=6442455473.

Figure 14. Hybrid industrial development typology from L.A.'s RENEW TOD Plan

The City of Los Angeles has a traditional zoning code that regulates uses rather than form. To assist developers in meeting community design and TOD goals, the recent "RENEW Transit Oriented Districts Plan" created a series of form-based development typologies that also met the standards of the existing zoning code. The full plan is available at http://cityplanning.lacity.org/staffrpt/initialrpts/CPC-2008-1552.pdf.

When revising a zoning code or creating new district types, several key items stand out to encourage transitions to a pedestrian-friendly environment. These components of the zoning code affect the distance between buildings and/or the street, reduce density, and otherwise limit concentrations of activity required to support transit. They include restrictions on setbacks, density, building height, and mixed uses as well as minimum parking requirements. See the checklist below for more information. Finally, municipalities on a BRT corridor may consider working together to establish consistent standards for station areas. This can encourage development across the corridor.

Zoning code revision checklist

☐ **SETBACKS:** Setback requirements address the distance between a building and the street, other buildings, and the property line. To support expressway-based transit, setbacks near stations should be minimized to allow for the maximum amount of station-adjacent development and to facilitate pedestrian movements.

☐ **FAR RESTRICTIONS:** Floor-area ratio (FAR) is the ratio between the area of a building and the area of its site. For example, an FAR of 1.0 allows a two-story building to be built on half of a site or a one-story building to be built on all of a site. Limits on FAR decrease the potential development intensity of a site. Transit works best in areas with higher densities of employment and residents. While there is no single FAR appropriate for TOD and higher densities must be calibrated to complement existing communities, average FARs less than 0.75 to 1.0 are not likely to support frequent, high-quality transit service. Communities should concentrate FAR increases in areas with transit access, expressway-based or otherwise.

☐ **HEIGHT RESTRICTIONS:** Similar to FAR restrictions, height limits reduce the potential density of a site. Taller buildings can be integrated into the community and, in an expressway environment, can serve to buffer the site from the noise and view of the expressway. Strategies such as stepping the height down or varying the building façade can help integrate taller buildings into low-density areas.

☐ **USE RESTRICTIONS:** Use restrictions limit the type of business, organization, or residence that can be developed in a district and, therefore, the variety of walkable destinations. A significant barrier to commuting via transit in an expressway environment is the inability to chain trips and accomplish more than simply commuting to and from work. Therefore, a transit-supportive zoning codes would allow a mix of uses on a single site, particularly uses that facilitate the ability of employees to run day-to-day errands and reach food, shopping, and entertainment. Additionally, interviews with local developers have indicated that employers want locations that are near populations of educated young professionals. Allowing for higher density housing near expressway-based employment centers can expand a community's employment pool, reduce traffic on local roadways, and create densities that are transit-supportive.

☐ **PARKING REQUIREMENTS:** The expressway environment is auto-oriented and some amount of parking will be required for most developments. However, strategies to limit the potential negative impact of parking in transit corridors should be incorporated into the zoning code. In areas directly adjacent to the station where transit-supportive land uses are desired, parking of any type should be limited. Strategies include creating parking maximums rather than minimums, encouraging the construction of parking decks for parking lots above a certain size, allowing mixed-use structures that incorporate parking decks above or between other uses, reducing the amount of parking, sharing parking, and/or charging for parking.

Provide Design Guidelines

Design guidelines work in tandem with zoning regulations to provide a complete picture of the type of development that a community desires in a station area. Design guidelines that require a transit orientation are particularly important in the expressway environment. Design guidelines can negotiate the balance between auto and pedestrian orientation to create an environment that supports access to the transit station. These guidelines can address appropriate densities, the mix of uses, relationship between a building and the street, façade treatments, parking intensity, overall building design, pedestrian accommodations and amenities, and other important factors that encourage transit-supportive built environment.

Establish Regulatory Incentives

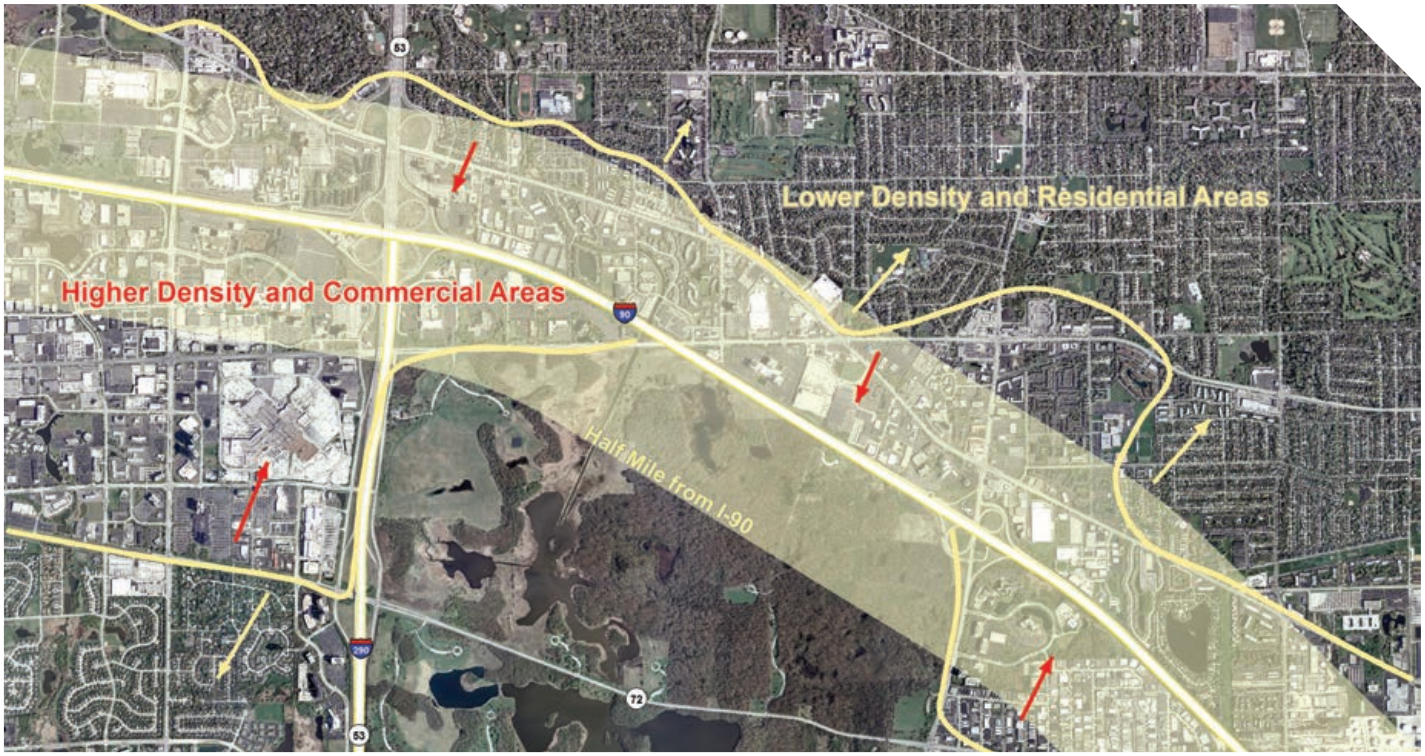
Regulatory incentives are administrative processes that can encourage a specific type of development by offering shortened timelines, fee waivers, or other inducements for that development typology or form. There is a broad menu of regulatory incentives, including zoning regulations that encourage transit-supportive development, expedited permitting processes, forgiveness of review fees for projects that meet specific criteria, and density bonuses for mixed-use or transit supportive developments. Regulatory incentives are received "as of right," have more certain outcomes, and can shorten the development timeline, which developers in good markets may view as more important than a less predictable monetary incentive. Certainty is important to developers because it allows them to better define timelines and costs.

In an expressway environment, regulatory incentives might be provided to developers that increase density near stations, provide additional pedestrian access and/or amenities, or provide mixed-use development in a formerly single-use environment. These incentives may also be prioritized for specific types of sites, such as formerly fragmented parcels containing obsolete commercial space or for the transitioning of parking lots to new development. These incentives should only be made available if the project as a whole meets basic design criteria to encourage pedestrian access to transit stations and surrounding developments.

Create a Strong Development Climate

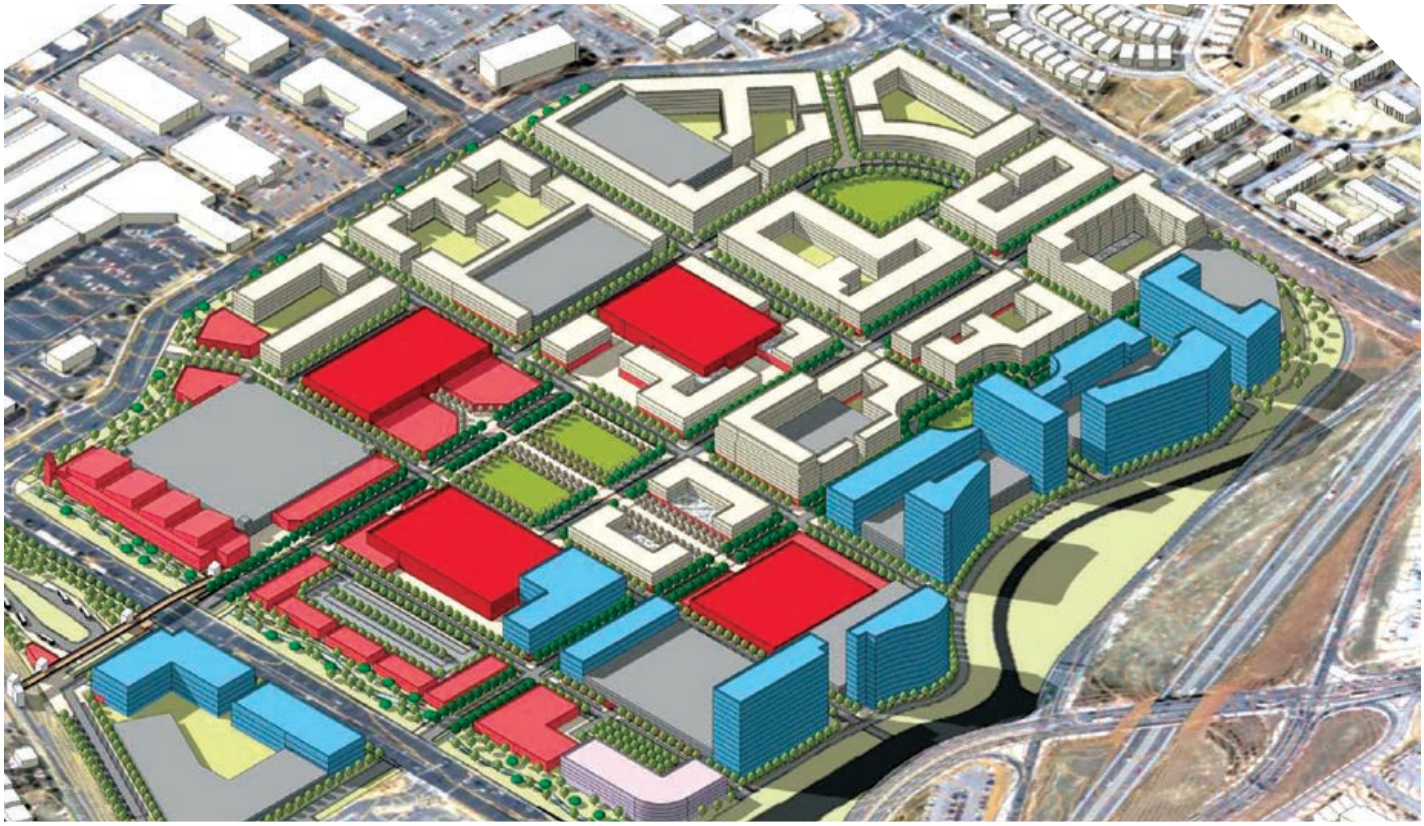
While the benefits of development near rail stations have been proven in many cases, this is not the case with bus-based TOD. Interviews with local developers have indicated that reliable, frequent service is critical to the success of bus-based development, but that ease of development at the local level is also a decisive factor in determining where to develop. The tools above, such as development of a station area plan, amendment of the zoning code, provision of design guidelines, and establishment of regulatory incentives are all part of creating an environment that facilitates "as of right" TOD. In areas where special approval processes are required for denser development or TOD, the development and planning expertise of staff (municipal or transit agency) has also been shown to be a factor in creating a positive perception of development in a community. Finally, coordinating across municipalities to create streamlined or consistent zoning codes and station area requirements can also benefit the development climate by creating a consistent set of standards for the corridor.

Figure 15. Concentrated development in I-90 corridor



This aerial shows I-90 near its intersection with I-290 and IL 53. In this area, commercial and higher density development has concentrated near the expressway. However, overall densities are still too low to provide a transit-supportive environment. Incrementally increasing densities in this corridor through easing FAR, height, and density restrictions and allowing a mix of uses can assist in transitioning land uses to a more transit-supportive form. For example, upzoning near DC's Orange Line in Arlington, VA, allowed development that would have covered 14 square miles at previous development patterns to cover only two square miles. Outside the corridor, lower densities were maintained. Further detail on this case study can be found in Virginia Transit Association's "Implementation Strategies for Successful Bus TOD Projects" at http://tinyurl.com/CIp7vf2.

Figure 16: Westminster Center re-envisioned



The image above depicts a massing concept for the former Westminster Mall in the City of Westminster outside Denver, CO. The mall was the largest enclosed mall in the Denver area with six department store anchors and 1.5 million square feet of retail space. It fell into decline in recent years and was purchased and demolished by the City of Westminster in 2011 and 2012. The site is located between the existing U.S. 36 BRT stop and a proposed light rail station. The site is approximately 0.4 miles from east to west and 0.45 miles from north to south.

Sources: City of Westminster at http://www.westminstercenter.us and the Boulder County Business Report at http://www.bcbr.com/article.asp?id=57445.

Pedestrian and Bicycle Connectivity

Improving multimodal access to station areas is a major component of any TOD strategy. The GO TO 2040 plan recommends planning for and installing pedestrian and bike facilities as a key component of improving quality of life and creating livable communities. Designing for the pedestrian and bicyclists creates places that are human in scale, encourage walking, and support transit. In the auto-oriented environment near expressways, the pedestrian and bike network is often incomplete. This limits access to transit and major destinations. In particular, sidewalk and bridge connections between developments and across the expressway need to be provided to create a more complete, non-motorized network.

Develop a Pedestrian and Bike Plan

The first step in improving non-motorized access is to create a pedestrian and bicycle plan. While pedestrians and bicyclists have very different needs, these two modes of transportation are often addressed together as part of a non-motorized transportation plan. Planning for bike and pedestrian access can identify gaps in the network and provide strategies to improve connectivity between transit services and major anchors in a community. It can also outline new recreational amenities for a community in the form of complete trails and bikeways. A pedestrian and bicycle plan can be part of a stand-alone plan, a larger community transportation plan, or the station area plan.

Provide Pedestrian Bridges/Crossings

Providing pedestrian bridges and other specialized crossings will increase access to the station area as well as to surrounding development. They have the potential to greatly increase the number of accessible destinations, particularly for stations that are not located on interchanges. Pedestrian bridges should be well-lit, accessible, and, where feasible, covered to protect pedestrians from the elements. Providing pedestrian connections to new developments may also encourage a more transit-oriented design in these developments.

Figure 17. Cumberland Station area

The aerial above shows the Cumberland Station area, an example of transit-adjacent development. Land use around the station is strong — denser commercial development clusters around the station and a mixed-use rental and retail complex has been proposed to replace an aging single-story office complex. However, the area has a significant amount of surface parking, minimal pedestrian connections, and auto-oriented building design, creating an environment that makes access to and from the transit station difficult. While there are pedestrian overpasses from the station to adjacent development areas, sidewalk connections through these developments are minimal and formal pedestrian routes are circuitous. Additionally, many of the area streets lack complete sidewalks and a wide interchange minimizes pedestrian and bicycle access across the expressway. Improved pedestrian connections are required to make this area truly transit-oriented.

Source: Chicago Metropolitan Agency for Planning.

Connect Station Areas to Surrounding Developments

While pathways within station areas are often well-designed, connections to adjacent developments are not always complete. The pedestrian and bicycle plan and/or station area plan should identify key missing connections between the station area and existing developments and prioritize their construction. New developments should also be required to connect to existing pedestrian networks and, where applicable, incorporate existing trails into their siteplan. While many suburban office and employment areas value a "campus" setting with greenspace and wandering paths, direct pedestrian connections to key destinations should also be provided. Finally, both visual and physical connections should be emphasized to provide a better pedestrian experience.

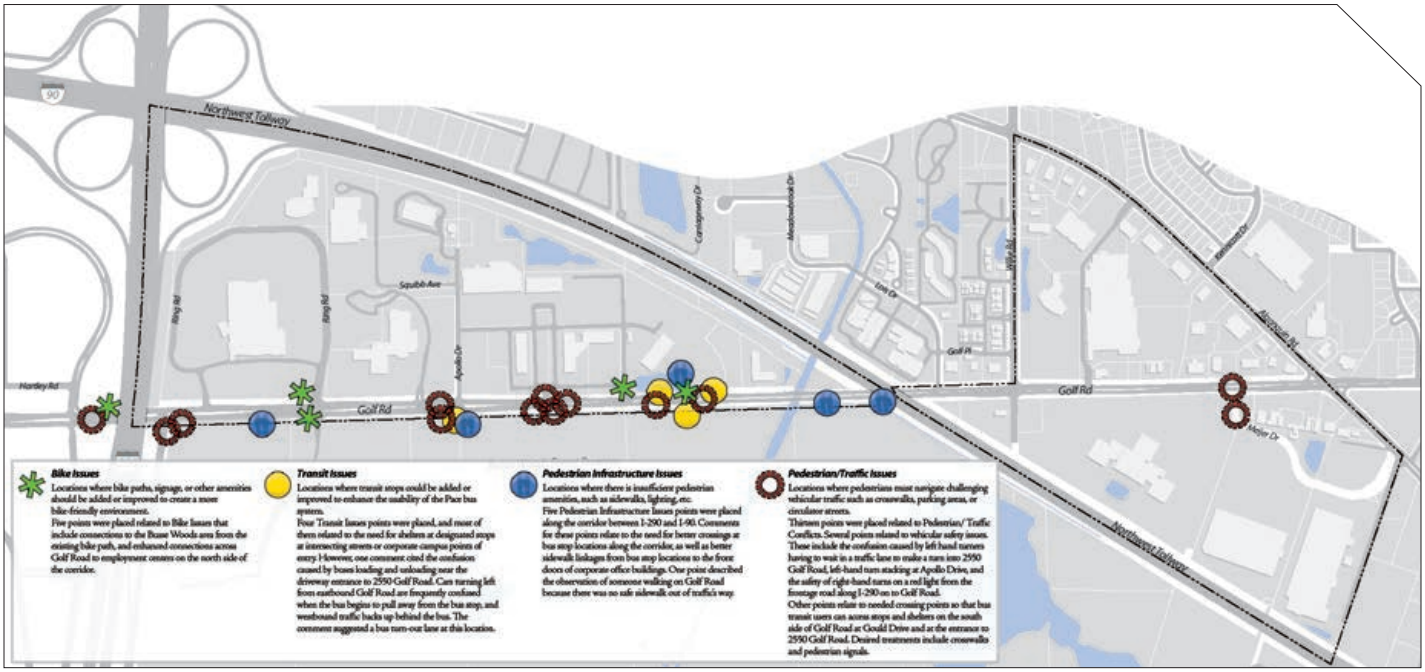
Improve the Streetscape

Streetscape investments not only facilitate pedestrian access, but also increase the visible investment in the BRT system, can be part of the overall marketing of a new system, and increase the perceived permanence of a BRT system. Research has shown that streetscape improvements implemented in tandem with BRT improvements can encourage use of the BRT system. Streetscape improvements that encourage pedestrian movements should be put in place BRT station areas. These can include the installation or widening of sidewalks, addition of pedestrian signals and crosswalks at intersections, lighting, wide sidewalks near stations, bus bump-outs, and coordinated stations.

Reconfigure Interchanges

In cases where expressway facilities or interchanges are being wholly reconstructed to accommodate BRT service and/or stations, interchanges should be reviewed for the potential to use an innovative design that utilizes less land and can increase pedestrian access and development potential. Alternative interchange designs must be chosen to carry the appropriate amount of traffic, but have the potential to reduce the size of a traditional interchange and maximize utilization of land. Using a smaller configuration shortens the distances that pedestrians and bicyclists must travel and can also create additional land that can be used for BRT stations, Park & Ride facilities, or joint development opportunities. Additionally, the area within the interchange can be utilized for purposes such as shared stormwater detention or parking, which may allow for development to be placed closer to stations. However, shared facilities have the potential to increase interchange size. Therefore, the ability to create shared facilities should be balanced with the need to promote pedestrian access and development potential. Emphasis should be placed not only on using less land for the interchange, but also on providing safe and comfortable pedestrian routes across the interchange.

Figure 16. Golf Road Transit and Pedestrian Mobility Plan



Within the I-90 corridor, the City of Rolling Meadows, local businesses, Pace, and the RTA are partnering in development of the Golf Road Transit and Pedestrian Mobility Plan in order to address transit and pedestrian access. This project is aimed at improving pedestrian access, circulation, and safety along the Golf Road Corporate Park south area, a major employment destination in the Village, located between I-90, Golf Road, and Route 53. The study intends to strengthen the transit connection by focusing on pedestrian activity to increase ease of use, accessibility, convenience, and safety for pedestrians, making the area transit friendly.

Image courtesy of City of Rolling Meadows, Regional Transportation Authority, and Houseal Lavigne Associates.

Marketing and Permanence

BRT systems cannot be successful over the long term without cultivation of a strong market for transit. However, BRT and bus systems face negative perceptions about system service, reliability, and safety. Many new BRT systems have worked to combat these with unique branding, stations and vehicles, travel time improvements, and marketing campaigns. Additionally, bus systems can be seen as impermanent because they lack the highly visible physical investment of rail transit. While there are a number of guides available describing operational strategies to improve ridership and perceptions of BRT services, fewer focus on elements that encourage supportive development. This section provides several strategies for transit agencies, municipalities, and other stakeholders to use in promoting the supportive land use around a BRT system.

Agency Commitment to Transit

One of the largest barriers to encouraging TOD around bus stations is the perceived impermanence of bus systems, including the long-term commitment of transit agencies to a given line. Without a high level of commitment, transit-supportive development will not occur. Literature review and interviews with local developers have indicated that some level of visible capital investment is needed to demonstrate that a transit agency and local stakeholders are committed to a BRT system over the long term. However, these initiatives can be completed at a lesser level than rail. For example, special stations that are more rail-like in nature, unique vehicles, and some bus-prioritization features in traffic lanes are basic BRT features with a high impact on visibility and reliability.

Figure 18. 46th Street station, Minneapolis, MN

This image shows the 46th Street Station on Minneapolis' expressway-based BRT line, some portions of which are located in the center of Interstate 35W. The new stations on this line are enclosed at street level and offer shelter from the elements. The stations also have distinct architectural features and offer a unique brand for the BRT line. I-35W is an urban expressway that traverses moderate to high-density urban neighborhoods. Due to the substantial existing development on both sides of the expressway, a within-expressway alignment was chosen for the BRT line. In less dense suburban areas, expressway-adjacent or off-expressway stations may be preferred. Interviews with Chicago-area developers indicated that upgraded stations that are distinctive, permanent and offer shelter from the elements are preferred to help demonstrate a long-term commitment to the transit line. While investment at the level of the 46th Street Station is not required, upgrades that make BRT stops more "Metra-like" were considered very important to increasing the perceived permanence of a BRT line.

Image courtesy of Metro Transit.

Additionally, expressway-based systems that involve a higher level of investment in the form of bus-only ramps or more substantial stations also have more perceived permanence. Finally, maintenance and upkeep of stations, signage, and lighting was also seen as a critical, ongoing commitment.

Other, less tangible factors are also important to prove commitment to BRT service. While the shape of development is significantly impacted by local regulations, it cannot occur at all without market demand. Interviews with local developers have indicated that demand for TOD cannot exist without demand from employers and residents for facilities and housing near transit. In particular, maintenance of a reliable, on-time service is critical to generating employment-based demand. Similarly, working to improve connections between transit modes, particularly between services that have less frequent headways, is important. This includes allowance to wait for connecting services that may be a few minutes late. A transit agency's ability to work with business owners and employers to address these issues on an ongoing basis is another clear indicator of agency commitment to the BRT service.

Coordinated Investments

Coordinating streetscape, public building, or other infrastructure investments with the opening of a new BRT line can help to increase the perceived permanence of a BRT line. These investments are highly visible and add weight to the municipal and transit agency commitment to the BRT system. Additionally, these investments can address gaps in pedestrian networks, improve safety, update transit facilities, and otherwise remove barriers to accessing a BRT service. As with station area planning, these improvements are best addressed from the perspective of the corridor as a whole, rather than solely on a station-by-station basis.

Municipal Planning and Station Area Initiatives

Municipal plans, design guidelines, and other initiatives related to station area planning can attract development to a site. The planning processes also serve as an important vehicle to educate residents and stakeholders about BRT and station area planning as well as publicize the BRT system. However, to be most effective, municipal zoning codes and development policies must be aligned with the goals of the station area plan.

Operational Strategies

As noted previously, fast and reliable service is seen as critical to attracting ridership, and, therefore, employer and developer interest in locating near BRT stations. While land use has a significant impact on congestion and the overall success of transit, operational strategies are a key to making transit more reliable and competitive. Strategies to improve operating times for both expressway-based and arterial-based BRT systems have been well-explored.[9] These fall into two categories: running time improvements and boarding and alighting improvements. Running time improvements reduce transit travel times and range from minimizing the number of stops to bus priority signals to bus-only lanes. Boarding and alighting improvements reduce the amount of time that a bus must stay at a station and can include multi-door boarding, conversion to a proof-of-payment fare system, or off-board fare collection. Wherever possible, strategies to make transit travel times more competitive with the automobile and to improve the on-time performance of the express-bus and BRT services should be put in place.

9 The Transportation Research Board provides a summary and analysis of BRT operational strategies in its 2003 report, "Bus Rapid Transit: Practitioner's Guide," at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_118.pdf. The TRB also provided a more extensive review of BRT in Volumes I and II of "TCRP Report 90: Bus Rapid Transit," available at http://www.trb.org/Main/Public/Blurbs/153530.aspx. Finally, the Institute for Transportation & Development Policy has authored a BRT rating system based on a series of operational and physical factors. Version 1.0 is available at http://www.itdp.org/documents/BRT_English_REVISED2_FINAL_LR.pdf.

In Denver, some pedestrian bridges have been funded by a combination of public and private funds. For example, the Dry Creek Pedestrian Bridge (above) utilized Federal and local dollars as well as funds from the adjacent business park.

Image courtesy of Jeffrey Beall at **http://tinyurl.com/c77dlvm**.

Image courtesy of Pace.

Implementing BRT-Supportive Land Use

This guide contains a first effort at providing guidance on station siting and land use decisions related to expressway-based BRT stations in the region. CMAP will work with transit providers, transportation agencies, municipalities, and other stakeholders to implement the strategies outlined in this report. Initiatives may include publicizing the findings of this report, working with communities through CMAP's Local Technical Assistance (LTA) program, and assisting planning efforts for major capital projects. In particular, CMAP will continue to provide tools to communities seeking to implement transit-supportive land use policies and create livable communities. Changing longstanding land use and development policies can be a difficult task. However, these changes are imperative to support the region's transit system, decrease congestion, and improve quality of life.

Resources

A companion technical document for this Guide is available on CMAP's website:
http://cmap.illinois.gov/brt

RTA's Land Use and TOD Initiatives:
http://www.rtachicago.com/index.php?Itemid=325

RTA's Community Planning Program:
http://rtachicago.com/community-planning/community-planning.html

Pace's Development Guidelines:
http://www.pacebus.com/sub/guidelines/guidelines.asp

Metropolitan Planning Council's BRT Planning and Research:
http://www.metroplanning.org/work/project/3

Illinois Tollway's I-90 Corridor Planning Council:
http://www.illinoistollway.com/construction-and-planning/community-outreach/i-90-corridor-planning-council

Chicago Transit Authority's "Transit Friendly Development Guide":
http://www.cityofchicago.org/dam/city/depts/zlup/Planning_and_Policy/Publications/Transit_Friendly_Development_Guide/CTA_Typology_Study.pdf

Transit Cooperative Research Program's "Report 145: Reinventing the Urban Interstate: A New Paradigm for Multimodal Corridors":
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_145.pdf

CTOD: **http://ctod.org/index.php**
CTOD's "Transit Oriented Development and Employment" report:
http://ctod.org/pdfs/2011TOD-Employment.pdf

Institute for Transportation & Development Policy's "BRT Standard":
http://www.itdp.org/documents/BRT_English_REVISED2_FINAL_LR.pdf

General Accounting Office's "Bus Rapid Transit Projects Improve Transit Service and can Contribute to Economic Development":
http://www.gao.gov/assets/600/592973.pdf

Cover image courtesy of Pace.

Back cover images courtesy of (clockwise from upper left):Dorothy Peyton Gray Transportation Library and Archive at the Los Angeles County Metropolitan Transportation Authority; Pace; the Illinois Tollway; William Valicenti, 2010.

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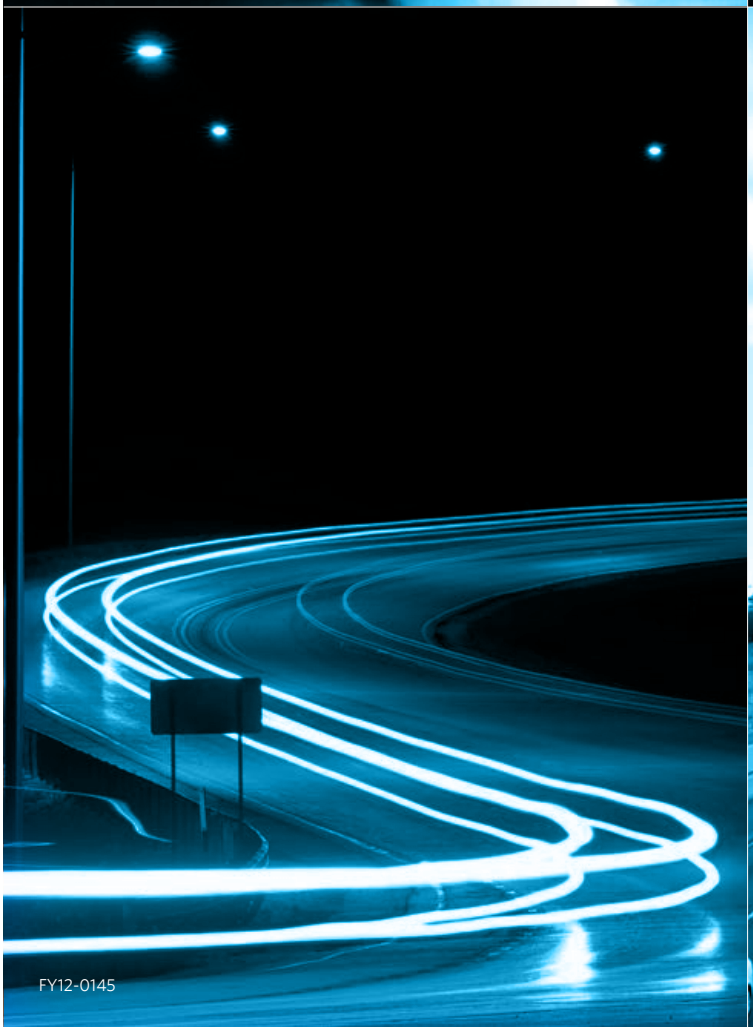

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