

The Economics of Land Use



Report

East Corridor Rail Line Case Studies

Prepared for:

East Corridor Working Group, and
Denver Regional Council of Governments

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1. INTRODUCTION AND BACKGROUND

Introduction

As a component of the Market Readiness Study, EPS conducted research on existing rail corridors in the Western and Central U.S. to identify case studies with applicability to the East Corridor. The purpose of this research was to assist corridor property owners, developers, and economic development officials with identifying lessons learned with application to economic development growth opportunities and specifically transit oriented development, and addressing specific market, infrastructure, and policy issues or impediments.

This report is organized into three chapters, outlined below, with a summary of key findings at the end of each chapter.

1. **Introduction and Background** – A review of national trends in commuter rail system expansion and related transit oriented development (TOD) real estate factors.
2. **Industrial TOD Case Studies** – A summary of the approaches and experiences of other cities in integrating passenger rail with industrial development, and more broadly on balancing demand for residential and other commercial development with industrial job preservation and attraction.
3. **Airport Line Case Studies** – A profile of airport to downtown transit lines including service characteristics and corridor land use and market conditions.

East Context

The previously submitted market analysis report identified three defining characteristics of the East Corridor, compared to the existing RTD rail lines that provide the basis for this research effort:

- Along with the Gold Line, it will be the first commuter rail line added to the existing RTD light rail system.
- The East Line will connect Denver International Airport (DIA) to downtown and therefore greatly increase the rail system's exposure to national and international visitors.
- Three of the East Line stations are surrounded by a large amount of industrial development. There is interest in expanding the number of and access to good paying jobs at all skill levels.

The fact that East Line will be built as a commuter rail rather than a light rail line reflects some differences in the nature of the corridor compared to the light rail corridors. Similarly, commuter rail technology functions differently than light rail which can affect the amount and type of TOD that can be expected to occur in the future. EPS' research on the commuter rail lines built in the U.S. in the last 20 years provides common themes present in these corridors.

The most unique characteristic of the East Corridor is that it connects the central business district with Denver International Airport. The four downtown-to-airport lines profiled are: the MAX Red Line in Portland, OR; DART Orange Line in Dallas, TX; Metro Blue Line in Minneapolis, MN; and Central Link in Seattle, WA.

The East Corridor travels through one of the largest concentrations of industrial jobs in Metro Denver, along the East I-70 corridor in northeast Denver and northwest Aurora. The DRCOG Regional Economic Strategy (EPS, 2014) identified an existing concentration of middle skills jobs paying a living wage and accessible to residents in the corridor at many station areas. Preserving these employment uses can potentially be in conflict with TOD planning that generally encourages the concentration of higher density employment and residential uses at station locations. EPS researched how other cities have approached TOD in industrial settings and profiled three projects: Chicago Green TIME Zone, Chicago-Southlands, LA Cornfields Arroyo Specific Plan, Los Angeles; and Eastern Neighborhoods Plan, San Francisco.

Commuter Rail and TOD

This section provides an overview of the history of commuter rail in the U.S. and a summary of recent lines built over the past 20 years. It also provides a discussion of the physical, transit operations, and market factors that affect commuter rail TOD in contrast to light rail TOD. Commuter rail differs from light rail or heavy rail (e.g., San Francisco's BART or Washington D.C.'s Metro systems) in terms of its operational and equipment characteristics and markets served. Similarly, TOD opportunities associated with commuter rail also have some important distinctions. Commuter rail is most often passenger transit service utilizing diesel or electric propelled trains on existing track and/or new track within an existing freight rail corridor. It generally provides frequent peak-hour service and work-trip oriented service of longer distances, typically 20 miles or more, with longer station spacing of two to five miles. In contrast, light rail generally provides more frequent service both during the peak hour and throughout the day and evening. Light rail station spacing is closer, generally less than two miles, and even down to blocks in dense urban settings.

Until recently, commuter rail systems were only found in the largest metropolitan areas including Boston, Chicago, Montreal, New York, Philadelphia, San Francisco, and Toronto. These systems are made up of multiple commuter rail lines connecting outlying suburbs to the central business district and also tying into a finer grain light rail, heavy rail, or subway system within the central city. The numbers of destinations that are accessible from these older systems are therefore much larger than some of the newer systems.

In the last 20 or so years commuter rail lines have been built in smaller urban markets including Albuquerque, Austin, Dallas, Los Angeles, Miami, Minneapolis, Salt Lake City, Portland, and Seattle, as shown in **Table 1**. A number of these lines (e.g., Austin and Albuquerque) are single corridors rather than components of a larger system and typically have approximately 10,000 average daily riders or less. However, like Denver, other commuter rail lines have been built as components of a more multifaceted regional rail system with other modes including Seattle, Portland, Minneapolis, Salt Lake City, and Dallas. Ridership numbers on these lines are generally higher and have the potential to increase as the system develops and provides greater regional accessibility options.

Table 1
Commuter Rail Systems in the United States, 2012

Rank by Ridership	System	Major Cities Served	Avg. Weekday Ridership	Route Miles	Lines	Stations	Date Opened
1	Long Island Railroad	New York	334,100	321	11	124	1836
4	New Jersey Transit Rail	New York / Philadelphia	302,000	398	11	164	1983
3	Metro-North Railroad	New York	298,700	385	6	122	1983
2	Metra	Chicago	292,600	488	11	241	1984
6	SEPTA Regional Rail	Philadelphia	130,900	280	13	153	1983
5	MBTA Commuter Rail	Boston	124,400	368	13	127	1973
7	Caltrain	San Francisco / San Jose	50,800	77	1	32	1987
8	Metrolink	Los Angeles	40,800	388	7	55	1992
9	MARC Train	Baltimore / Washington D.C.	34,100	187	3	43	1984
10	Virginia Railway Express	Washington D.C.	15,900	90	2	18	1992
11	Tri-Rail	Miami	14,800	71	1	18	1987
16	UTA FrontRunner	Salt Lake City	14,700	88	1	16	2008
13	Sounder Commuter Rail	Seattle / Tacoma	11,900	80	2	9	2000
12	NICTD South Shore Line	Chicago	11,600	90	1	20	1903
14	A-Train	Denton	8,600	21	1	6	2011
15	Trinity Railway Express	Dallas / Fort Worth	8,000	34	1	10	1996
17	NCTD Coaster	San Diego	5,200	41	1	8	1995
19	Capital Corridor	San Jose/Oakland/Sacramento	4,300	168	1	15	1991
20	Altamont Commuter Express	San Jose	4,100	86	1	10	1998
18	New Mexico Rail Runner Express	Albuquerque	3,500	97	1	13	2006
21	Northstar Line	Minneapolis	2,500	40	1	6	2009
23	Capital MetroRail	Austin	2,400	32	1	9	2010
22	Shore Line East	New Haven	2,200	59	1	13	1990
24	Westside Express Service	Beaverton	2,000	15	1	5	2010
25	Music City Star	Nashville	900	32	1	6	2006

Source: APTA, Economic & Planning Systems

H:\143020-GoldCorridorMarketReadinessStudy\Data\143020-CommuterRailRidership.xlsj Ranking

Commuter rail TOD opportunities are different than those associated with light rail or heavy rail systems due to its more limited scope, both in terms of frequency of service as well as the portion of the region that can easily be accessed by transit. Both factors limit the accessibility premiums that translate to increases in real estate market demand and higher land values. The nature of existing land uses in the commuter-freight rail corridor can also be less compatible with adjacent TOD. Sound levels associated with diesel locomotives and horns are louder, there are often larger transit parking fields, and freight rail movements generate impacts less compatible with residential and office-based employment development. As a result, TOD uses are often situated farther away from the station in order to mitigate these impacts.

The existing land development pattern in commuter rail corridors is also often not compatible with TOD, as it can include manufacturing and distribution uses that require direct rail service as well as other heavy industrial uses. Despite these limitations, there remains a great deal of interest in TOD at commuter station locations, particularly on these newer lines where land use and development patterns are less fully built out.

Even in some of the country's largest light and heavy rail systems (e.g., WMATA in Washington, D.C. and BART in San Francisco) it has taken 15 to 20 years from systems opening for any significant TOD to materialize. The scale and land uses in commuter rail TOD are different than light and heavy rail TOD. Since commuter rail often serves more suburban areas, the land use mix appears to be, so far, more weighted to residential development, unless a station already is located in a major employment area. Commercial development tends to be lower intensity as the retail and services businesses that serve surrounding residents do not necessarily depend on the transit service for business.

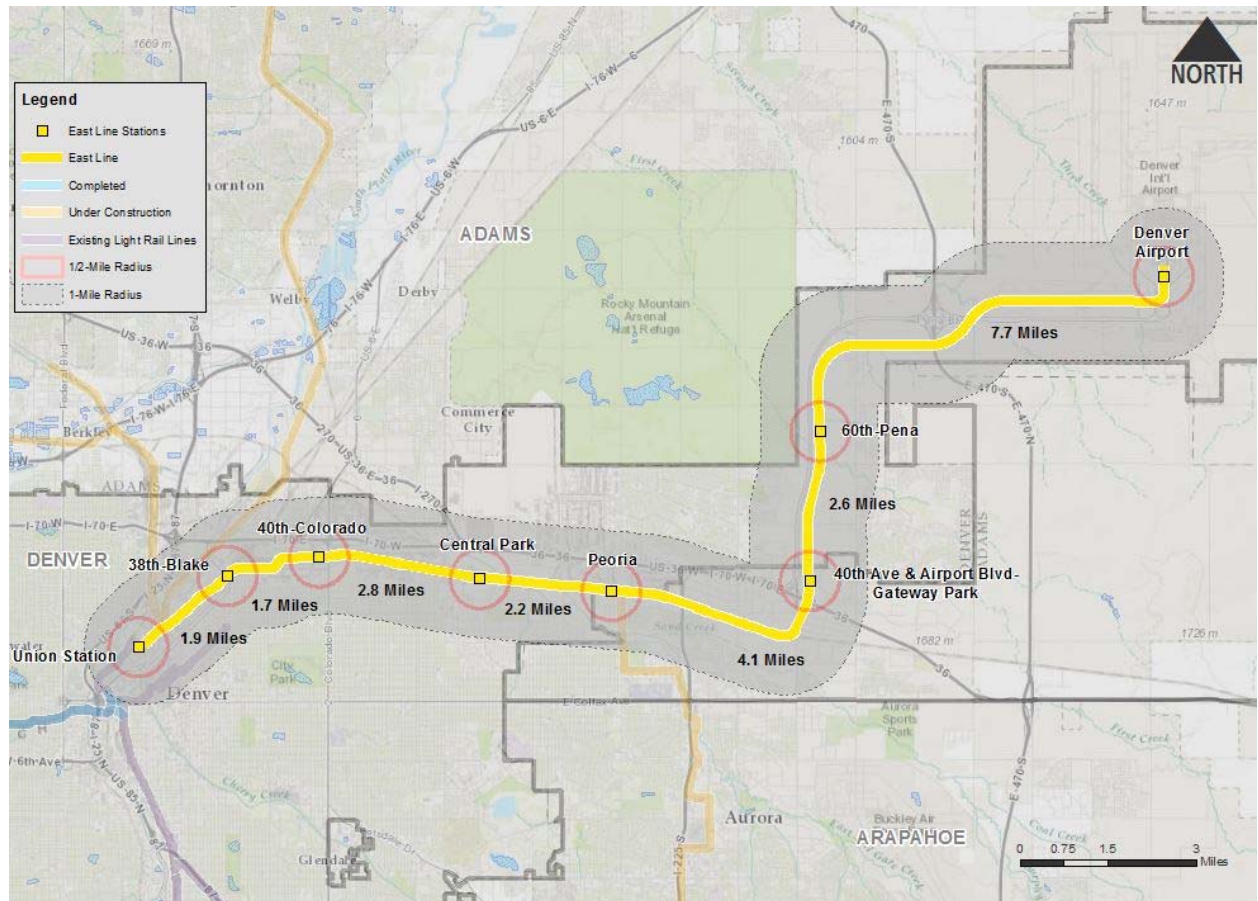
However, major demographic and economic shifts that have occurred in the past 5 to 10 years suggest that the demand for TOD real estate will continue to increase, enabling development to accelerate. These include the Millennial Generation's preference of renting over owning and lower rates of car ownership; baby boomers seeking downsized low maintenance housing and less desire or ability to drive as they age; rising fuel and construction costs over the long term; and less availability of mortgage financing and personal savings towards housing down payments among younger generations and those affected by the Great Recession.

Another favorable consideration is that the East Line is also expected to operate using light rail service frequencies with headways of 7 to 15 minutes on a 24-hour schedule. Furthermore, the lines are completely electric with overhead catenary similar to RTD's LRT lines, thus eliminating much of the noise impacts of diesel engines. They will also eliminate stairs by having level boarding, a superior system compared to those at existing LRT stations.

FasTracks Commuter Rail




The FasTracks commuter rail lines have some of the challenges and opportunities for TOD identified above. However, the design and operating characteristics of the new lines are intended to be more “light rail like” and will likely mitigate some of these limitations. The East Line is 23 miles in length with station spacing ranging from less than two miles apart on the stations close to downtown, but increasing to four to eight miles when closer to DIA, as shown in **Figure 1**.

Figure 1
East Line Station Spacing



The East Line does have a number of the limitations outlined above and typically associated with commuter rail that is built within existing industrial rail corridors. In the downtown to Peoria segment, the line runs adjacent to an active Union Pacific double track freight line. Associated with the freight line, there are rail spurs and rail related industrial and shipping uses along the Corridor. There also limited crossing locations making property access to the station difficult or circuitous from properties on the opposite side of the tracks.

TRANSIT MODE	DESCRIPTION	
Conventional Bus	<ul style="list-style-type: none"> • Utilizes existing streets with minimal investment in stations. • Frequent stops and comparatively low operating speeds. Ride can be bumpy and noisy compared to rail. • Flexible routes, noise, and lower quality of service limits economic impacts. 	
Enhanced Bus	<ul style="list-style-type: none"> • Less investment in guideway and stations compared to BRT. • Ride is less comfortable than rail; may be subject to traffic delays. • Focused on AM/PM peak trips and home-work trips. • Less permanence and lower quality service limits economic impacts. 	
BRT	<ul style="list-style-type: none"> • Investment in fixed guideway, but less permanent than rail. • Provides a high level of service throughout the day, not just the AM/PM Peak. • Serves multiple home, work, and activity/entertainment destinations. • Gold Standard BRT can have economic impacts equal to light rail. 	
Streetcar	<ul style="list-style-type: none"> • Permanent investment in fixed guideway • Serves closely spaced destinations at operating speeds that are lower than LRT. • Provides frequent service throughout the day and night. • Economic and real estate impacts are localized compared to more regional systems, limited to a 1 to 3 block distance from the alignment and stations. 	

TRANSIT MODE	DESCRIPTION	
LRT	<ul style="list-style-type: none">• Permanent investment in fixed guideway.• Provides a high level of service throughout the day, not just the AM/PM Peak.• Serves multiple home, work, and activity/entertainment destinations.• Station design can support TOD.	 A white and blue light rail train is stopped at an outdoor station platform. A person is standing on the platform near the train. The platform has a yellow tactile strip along the edge.
Heavy Rail	<ul style="list-style-type: none">• Permanent investment in fixed guideway• Same as LRT but with additional passenger capacity and even higher levels of service throughout the day and night.• Serves the highest density urban markets.• Station design can support TOD.	 A white and blue heavy rail train is stopped at an underground station platform. The platform has a yellow tactile strip and an "EXIT" sign. The train is numbered "153".
Commuter Rail	<ul style="list-style-type: none">• Permanent investment in fixed guideway• Highest level of service is during the AM/PM peak.• Focuses on the home-work commute and a more limited number of activity/entertainment destinations than LRT or heavy rail.• TOD is possible but often constrained by the need for large park-n-ride lots and the presence of adjacent industrial land uses when ROW is shared with freight rail.	 A green and yellow commuter rail train is stopped at an outdoor station platform. The platform has a brick structure and a roof. The train is numbered "100".

Commuter Rail TOD Considerations

Multiple market, economic, and physical factors that are unique to each urban environment and each rail corridor influences the type of development that occurs, whether it is mixed use TOD or more conventional employment development. It is important to consider the impacts of each factor when comparing TOD and TOD programs across different systems; what has been successful in one market may not be as successful or even possible in another. Broad observations and experiences from other commuter rail lines and the larger transit systems in which they operate are outlined below for consideration along with the case studies presented in the chapters that follow.

Size and Geography of the Metro Area – The population and employment growth within a metro area determines the overall demand for housing, employment, and commercial space. Larger and faster growing metro areas like Dallas and Seattle have greater demand for housing and commercial development than smaller or slower growing metro areas. Larger cities also tend to have more diversity in housing, partly due to greater demographic diversity and partly to other market factors such as land costs and physical geographic constraints. High land costs and a constrained land supply will result in higher development densities. The East Line has relatively low densities and land costs, and at a number of stations it also has an abundant supply of undeveloped land. The appropriate level of density at a TOD will therefore be relative to the density of the area surrounding it and will vary by station location and context.

Land Use Policy – State, regional, and local land use planning also affects the demand for TOD and high density mixed use development. Specifically, policies that restrict the amount of land available for development result in greater demand for the land that is available and therefore higher land values. Higher land values in turn require higher density development in order to be economically feasible. In the case of the Portland metro area, there are strong state and regional level land use transportation planning and growth management laws that favor high density development along transit corridors over lower density greenfield development. The DRCOG region does have some regional land use control through the urban growth boundary and transportation funding that prioritizes infill and transit development.

Automobile Congestion – In cities with high levels of roadway congestion like San Francisco and Seattle, the market places a premium on TOD locations for housing and employment development. When commuting by automobile affects worker productivity and quality of life, employers and households may choose locations with direct transit access to avoid the frustration of traffic jams and reduce travel times. The rising cost of fuel is also likely to increase the demand for housing and employment in TOD locations. The East I-70 corridor, parallel to the East Line, is one of the most congested roadways in Metro Denver.

Quality and Extent of Transit Service – Having a transit system that provides frequent reliable service, a good rider experience, and relatively complete regional access is directly related to market demand for real estate development at stations. In mature transit markets with a fully developed transit system, one can live without an automobile because of the level of transit access and frequency of service. Like Denver, all of the cities studied including Dallas, Salt Lake City, Portland, Seattle, and Minneapolis are in the process of developing more robust rail transit systems. As these systems expand, the market demand for TOD real estate will grow.

Development Timing – More mature rail systems (e.g., San Francisco and Washington, D.C.) did not start seeing significant TOD until after they were operating for 10 to 20 or more years. In Portland, Dallas, and Seattle, TOD is taking place much faster in response to proactive local and regional land use and transportation, and to planning and policy that encourages high density development along transit corridors. In addition, fundamental demographic and economic shifts lead many to expect that the demand for transit oriented real estate will increase. These factors include rising energy and transportation costs, higher preferences for renting and mixed use urban environments among young people, and demand for smaller low maintenance housing accessible to services by aging baby boomers.

2. DOWNTOWN TO AIRPORT LINES

Airport rail links are common in Europe, Asia, and Canada. However, prior to 2000, only eight major US cities had direct rail service to the airport: Atlanta, Cleveland, Chicago, New York/JFK, St. Louis, Newark, Philadelphia, and Washington, DC (Reagan). Since 2005, nine more cities—Boston, Minneapolis, Portland, Seattle, San Francisco, Dallas, Miami, Phoenix, and Salt Lake City—have completed airport rail lines, with three more under construction in Denver, Oakland, and Washington (Dulles).

Although popular, these airport rail lines generally account for less than 10 percent of airport travel at US airports compared to 30 percent or greater at many European airports. The most successful is the BART line to San Francisco International Airport (SFO) with 11,000 daily riders (4.1 million annual) compared to 41.0 million air passengers per year, which at 10 percent makes it the US airport with the highest public transit usage. Other successful airport lines are in the 5 to 10 percent of airport travel range and include Portland with 3,200 daily boardings (1.2 million annual) out of 15 million annual passengers at PDX, which is 8 percent; and Seattle with 8,000 daily boardings (2.9 million annual) out of 35 million annual passengers at SeaTac, which is 8 percent. The East Line EIS estimated opening year average daily boardings at 6,200 (2.3 million annual) compared to 53 million annual passengers.

The success of airport rail lines is therefore dependent on interim stations also accessing downtown and other locations on the system, as well as providing an alternative mode travel option for airport employees. The East Line has the potential to be one of the best airports to Downtown transit connections in the U.S., giving Metro Denver increased exposure and positive experience to outside business and tourists. Travelers will be able to make the connection from DIA to the East Line by walking through baggage claim in the main terminal building and through a hotel lobby directly to the station platform. Service is expected to be at 15-minute intervals during morning, daytime, and evening hours, while the travel time to Union Station is estimated at 35 minutes. Other U.S. airport to downtown connections require connections on rubber tire shuttle buses, walks through parking lots or parking structures, or travel between terminals by monorail or other vehicles, adding to the complexity of the transition. The DIA connection will be world class and similar to systems in major European and other global cities. Four downtown-to-airport rail lines are profiled below including data on along with information on transit line service and ridership statistics and transit corridor market and land use context.

Minneapolis - Metro Blue Line

Length: 12 miles

Mode: Light Rail

Number of Stations: 19

Year Opened: 2004

Average Weekday Ridership: 33,500

Daily Trains: 109

Weekday peak service frequency: 10 minutes

Travel Time: 28 minutes (airport), 41 minutes (Mall of America)

Fare: \$1.75 (off peak), \$2.25 (6-9 am and 3-6:30 pm Monday-Friday)

Metro Transit is the primary rail and bus transit operator in the Minneapolis-St. Paul metropolitan area. The Metro Transit rapid transit system currently consists of two light rail lines and one BRT corridor. The Blue Line (formerly Hiawatha Line) is a light rail corridor which runs from Target Field in downtown Minneapolis to Minneapolis-St. Paul International Airport and continuing on to Mall of America in Bloomington, a city of 86,000 in the southern suburbs **(Figure 2)**.

A second LRT line opened in 2014. The Green Line is 11 miles long and connects downtown Minneapolis to downtown St. Paul.

The Minneapolis/St Paul metro area has a population of approximately 3.45 million and the City of Minneapolis has a population of 386,000. The agency reported average weekday ridership of 33,500 for 2013, a figure that already surpasses the initial 2020 projection of 24,800 daily riders.

Interest in a new rail project emerged in the late 90's and early 2000's due to rapidly increasing traffic congestion and support from politicians that included Jesse Ventura. The popular choices for a new line included one connecting Minneapolis to the western suburbs and another running between Downtown Minneapolis and St. Paul. Although not the first choice, this route along Hiawatha Avenue corridor gained traction mainly because much of the land was already under state control for a planned radial expressway that did not come to fruition in the 1960's. Also, a previously completed environmental impact statement found that light rail would be the appropriate transit option for this corridor. These factors, along with the desire to connect downtown to the airport and the Mall of America, were enough to sway decision makers. The final construction cost for the line was \$715.3 million or \$59.6 million per mile. Federal funding accounted for \$334.3 million of the total cost.

Figure 2
 Minneapolis Metro Blue Line



Source: Metro Transit

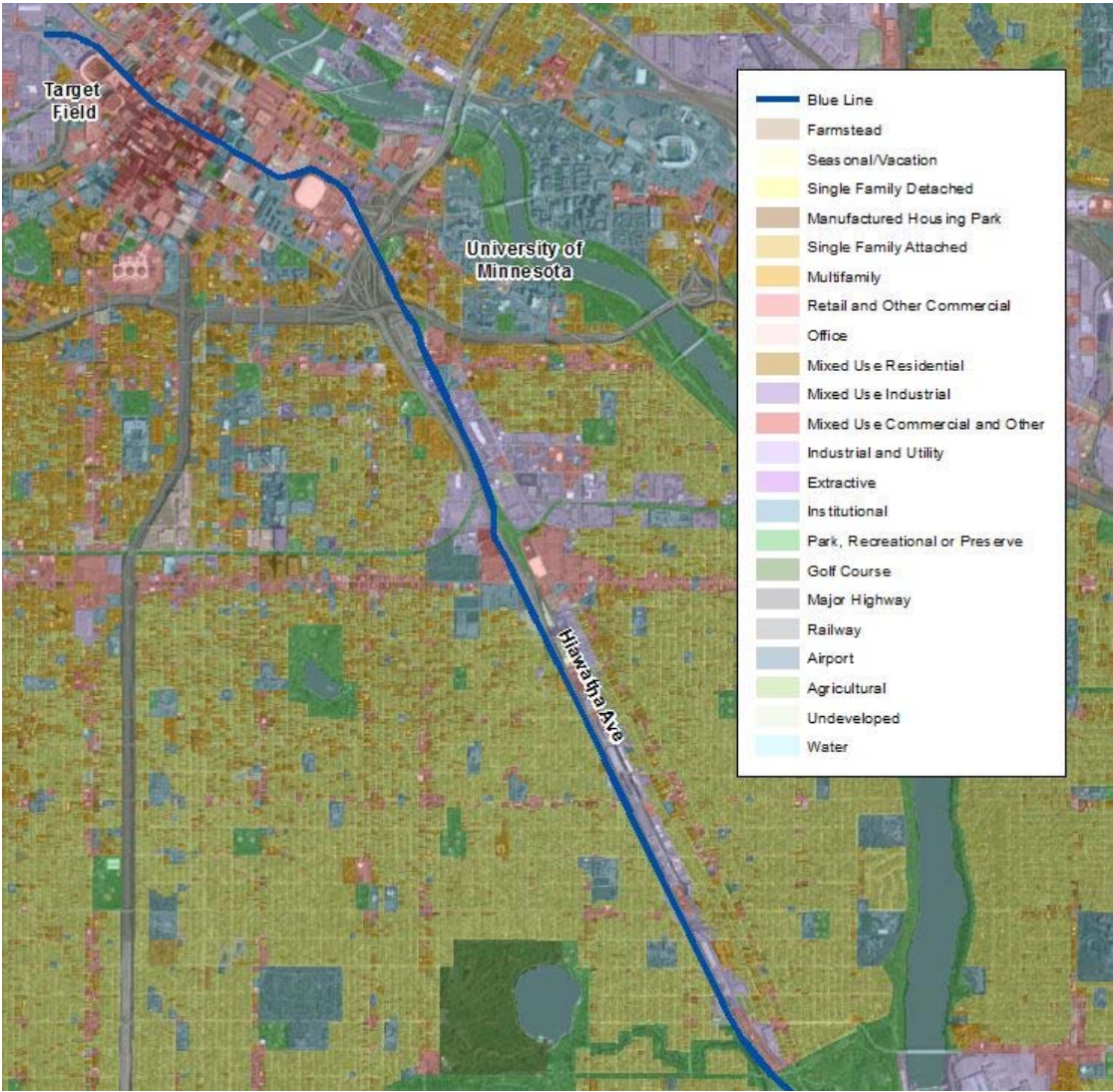
Corridor Land Use and Market Conditions

A range of land uses exist along the Blue Line corridor. Since it parallels a major roadway for much of the span, commercial and industrial uses are mixed with mostly single family residential. The north terminus at Target Field is part of the downtown core (**Figure 3**). This dense urban context continues past the Downtown East Station to the interchange of Interstates 35 and 94 where Cedar-Riverside station serves Augsburg College and the University of Minnesota Hospital and Carlson School of Management. Just across the river is the University of Minnesota's main campus, which can be accessed by the Green Line. After crossing the interchange, the Blue Line begins to parallel Hiawatha Avenue, after which it was originally named. In this stretch it is sandwiched between Hiawatha Avenue and a mix of big box retail and industrial uses until it reaches the Lake St-Midtown Station. From here the context to the west shifts to mainly residential and the industrial becomes more prominent on the east. The residential development continues to the southern edge of the city where the corridor passes Minnehaha Park and the VA Hospital before reaching the airport and eventually the City of Bloomington and Mall of America (**Figure 4**).

Once it leaves the downtown core, the Blue Line is mainly surrounded by single family residential. About 65 percent of homes are in the mid \$100,000s to mid \$200,000s range with a median value of \$211,000. Of the 16,000 dwellings within a half mile of the line outside of the downtown core, 50.6 percent are owner occupants, 41.9 percent rent and 7.5 percent of units are vacant.

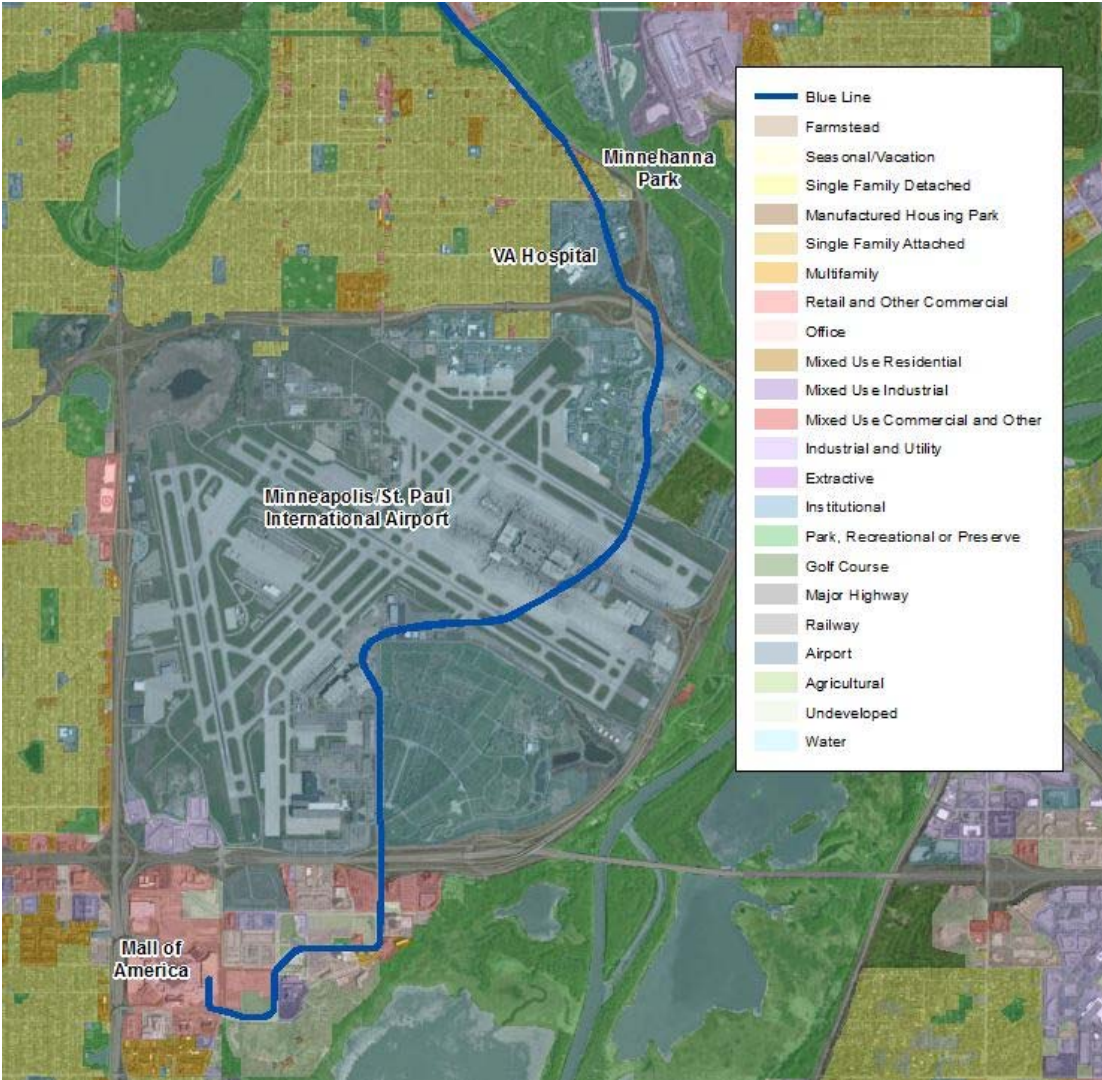
Initial projections called for 7,100 new housing units by 2020 in the areas surrounding the Blue Line. By December 2012, 10,500 new units were either completed or in progress with a further 4,500 being proposed. Recently completed or under construction projects include Seward Commons, Hi-Lake Triangle Apartments, and Longfellow Station Apartments. All three are located outside of the downtown core along the Hiawatha Boulevard corridor. Mixed-use and commercial/office development has also been spurred by the opening of the Blue Line. Projects include the American Academy of Neurology and Cowles Center for Dance and the Performing Arts, both downtown, and the East Phillips Park Cultural and Community Center, which is located south of downtown in the residential Phillips neighborhood.

Figure 3
Minneapolis Blue Line Land Use - North



Source: Metropolitan Council, Economic & Planning Systems

Figure 4
Minneapolis Blue Line Land Use - South



Source: Metropolitan Council, Economic & Planning Systems

Portland MAX Red Line

Length: 25.5 miles (12 miles from Downtown to PDX)
Mode: Light Rail
Number of Stations: 25
Year Opened: 2001
Average Weekday Ridership: 22,300
Daily Trains: 70
Weekday peak service frequency: 15 minutes
Travel Time: 60 minutes (38 minutes from Downtown to PDX)
Fare: \$2.50

The MAX system is run by the Tri-County Metropolitan Transportation District of Oregon (TriMet), which also operates the region's buses. It serves the greater Portland area, including Multnomah, Washington, and Clackamas County. The system is located in the Portland, Oregon metro area with a population of 2.3 million and the center city of Portland has a population of 610,000.

The MAX System was conceived in the 1970's when TriMet undertook a light rail feasibility study with funds from the defunct Mount Hood Freeway Project. Initially known as the Banfield Light Rail Project because it followed the path of Banfield Freeway (I-84), the original 15-mile east line connecting downtown to Gateway at the I-84 and I-205 interchange opened in 1986 at a cost of \$214 million. The 18-mile Westside Line to Beaverton opened in 1998 and the two lines connected in Downtown Portland and are now called the Red Line.

The 5.6-mile MAX Red Line Airport Extension was built in 2001 and runs from Gateway Transit Center in Northeast Portland to Portland International Airport (PDX) along the I-205 highway alignment, as shown in **Figure 5**. The MAX Red Line Airport Extension was proposed in 1997 as a response to increasing passenger service and limited land for additional onsite parking. The project was a public-private partnership between the City of Portland, TriMet, the Port of Portland and Bechtel, which paid for a large portion of the land cost in exchange for the rights to develop the Cascade Station property near the airport, then owned by the Port of Portland. The project took 2.5 years to complete and the \$125 million cost was divided as follows: \$45.5 million from TriMet, \$28.4 million from the Port of Portland, \$28.2 million from Bechtel Enterprises and \$23 million from the City of Portland. This unique partnership meant that no federal money or new local taxes were required.

Corridor Land Use and Market Conditions

The 20-mile eastern segment of the Red Line extends from downtown east over the Burnside Bridge across the Willamette River to the NE 7th Avenue Station near the city's Convention Center and Moda Center arena (formerly Rose Garden). A large mixed use TOD development is being developed at 7th Avenue and the station is closed for the next year while under construction. To the east is the NE 11th Avenue Station near the Lloyd Center Mall and Halladay Park. The line then generally runs along the north side of the I-84 right of way to Hollywood/NE 42nd Station, a multi-modal transit center serving the western portions of the Providence Health Medical Center. At NE 60th the line is surrounded by mainly industrial uses to the north and residential to the south of I-84. The Providence Health Medical complex can be accessed on the south side of the highway at NE 57th Avenue. The line continues along I-84 to NE 82nd Station and reaches the

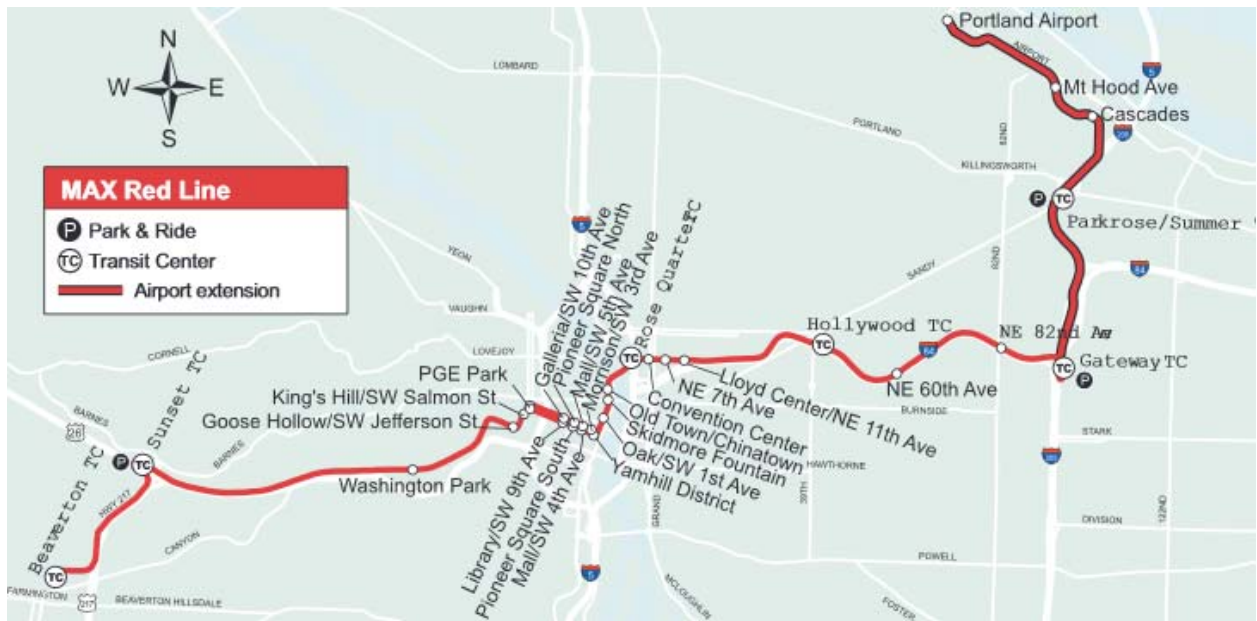
Gateway Transit Center at the intersection of I-84 and I-205. The area surrounding Gateway is an older suburban commercial district which has been designated as an urban renewal area.

The MAX Red Line Airport Extension uses the existing I-205 transit right of way until it reaches airport property at NE Airport Way (**Figure 6**). The surrounding context is largely residential and it borders Rocky Butte Natural Area for over a mile just north of Gateway Transit Center. Once it reaches Columbia Boulevard there is a large industrial area before finally transitioning to a big box commercial site at Cascade Station and airport related hotels along NE Airport Way.

The corridor was mostly developed prior to the construction of the line and so there are few opportunities for TOD. The 120-acre Cascade Station property, which Bechtel had intended to develop into a high intensity jobs and hospitality center, did not go forward as planned due to financing issues. Trammell Crow ultimately purchased the property and repositioned the site as a mixed-use retail, office, and hospitality center. Anchored by Ikea, Home Goods, Marshall's and Ross, Cascade Station currently features 400,000 square feet of retail space, two four-story office buildings, and a Hyatt Place hotel.

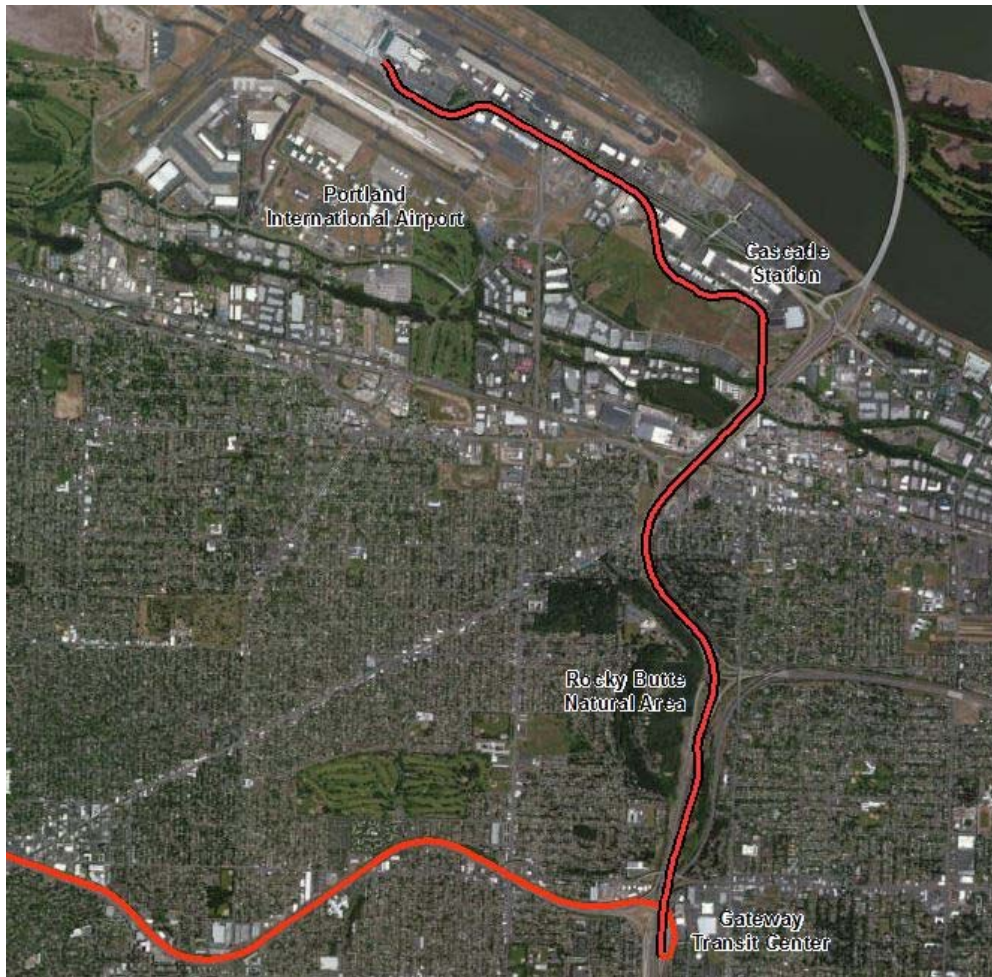
The surrounding residential development is mainly low density single family housing with about 2,100 people per square mile (less than five units per acre). Housing prices range from \$150,000 to \$250,000 with a median value of \$216,000. Of the 2,292 dwelling units within a half mile of the line, 59.6 percent are owner occupied, 34.8 percent renter occupied, and 5.7 percent of units are vacant.

Figure 5
Portland MAX Red Line Airport Extension



Source: Tri-Met

Figure 6
Portland MAX Red Line Airport Extension Aerial



Source: City of Portland, Economic & Planning Systems

Cascade Station

Cascade Station is the first station south of Portland International Airport (PDX) and the name for a 120-acre transit oriented and airport-supportive development. The station is located within a larger 2,800-acre urban renewal area stretching from PDX airport east through an existing industrial area along the Columbia River. It has approximately 600 riders per day. Businesses in the Airport Way URA range from airport hospitality to the west to moderate scale industrial, service, and distribution businesses to the east. The Portland Development Commission (PDC) is the Urban Renewal Authority, and is a major landowner in the URA. The URA generates revenue through tax increment growth and property sales.

The planning of the Cascade property began in 1997, four years before the Airport MAX line was completed in 2001. Development was delayed by both the post 9/11 recession of the early 2000's and by a plan that was not economically feasible. The PDC orchestrated a complex land sale and development rights swap with Trammell Crow. The entitlements and plan for the property were amended to allow large format retail buildings; the previous entitlements had a building size cap of 60,000 square feet, which was preventing the previous developer from

recruiting retail anchor tenants. It became clear that the remainder of the retail and hospitality tenants targeted for the development could not be attracted without first attracting some larger anchor stores. Trammell Crow was able to recruit IKEA, Target, and Best Buy to the site, which spurred the development of a retail power center, plus two 4-story office buildings and Hyatt Place Hotel. Employment development is targeted on the PDC-owned properties, including the two office buildings and a business park. Retail is prohibited on PDC-owned properties in this URA.

While not remarkable as a TOD, Cascade Station and the larger Airport Way URA shows an approach to urban renewal that often differs from practices in Metro Denver. PDC's investments were for area-wide infrastructure rather than narrower project specific incentives or subsidies. The URA contributed \$7.0 million to the extension and widening of Airport Way across I-205 into the industrial area to the east (\$25.0 million total project). The URA also helped fund several bridge, intersection, and trail improvements to increase connectivity in the area, linking businesses to each other and the Airport. The \$125 million Airport MAX extension received \$23 million from the URA. PDC did contribute to the Cascade Station development through debt restructuring and taking a junior position in a loan to the developer.

PDC also partnered with an institutional developer, Panattoni Development, to develop the Logisticourt Business Park within the URA. The terms of the development agreement require "quality jobs" to be created, with a minimum wage of twice the State minimum wage or approximately \$13 per hour. Businesses include a relocation of a LaCrosse footwear manufacturing facility, a large hospital services business, and a distribution facility. Other manufacturers are also located in the larger URA: Leatherman Tool Group; Triad Speakers, a high-end speaker designer and manufacturer; Harry's Fresh Food, a food manufacturer; and Thortex, an aerospace and orthopedic manufacturing firm.

- Land assemblage is a key implementation measure at Cascade Station and in the business parks in the surrounding URA.
- PDC has seen success in linking living wage middle skill job requirements to development partnerships.
- PDC and the Airport Way URA show the impact of area wide infrastructure investments, and an active role as a development partner.

Central Link – Seattle, WA

Length: 15.6 miles
Mode: Commuter Rail
Number of Stations: 13
Year Opened: 2009
Average Weekday Ridership: 37,350
Daily Trains: 134
Weekday peak service frequency: 7.5 minutes
Travel Time: 38 minutes
Fare: \$2.75

The Central Link runs from the Seattle neighborhood of Westlake north of downtown to Seattle-Tacoma International Airport (**Figure 7**). The City of Seattle has just over 650,000 residents with a metro population of 3.6 million making it the 15th largest metro area in the country. The Link system is operated by the Central Puget Sound Regional Transit Authority (Sound Transit), an organization encompassing Snohomish, King and Pierce Counties which also operates express bus and commuter rail service in the City. It is operated under an alliance with King County Metro (Metro), a department of the King County Department of Transportation, the operator of the city's bus system.

In 1996, voters in Snohomish, King and Pierce Counties approved a \$3.9 billion transit package funded by increases in county sales and vehicle excise taxes. \$1.7 billion of these funds were to be allocated to a 25 mile light rail system connecting the University District with the airport as well as a second line in Tacoma. Many issues were encountered in the ensuing years including an unfavorable environmental impact statement and objections from some poorer neighborhoods. As a result, costs rose significantly and the federal government threatened to withhold funding. After several alterations were made including shortening the line, Sound Transit began acquiring land in the Rainier Valley south of Seattle near the airport in 2002. The construction phase officially broke ground in late 2003 with completion of the initial segment in July 2009 and the extension to the airport in December 2009.

Corridor Land Use and Market Conditions

The northern terminus of the line is in the neighborhood of Westlake, one of the city's major dining, shopping and entertainment districts just a few blocks east of the iconic Pike Place Market. As it continues south, it passes through Seattle's downtown core and financial district served by University Street Station and the Pioneer Square area. Next are the International District and stadium areas where two new facilities for Seattle's NFL and MLB franchises are stimulating commercial development. The SODO area south of the stadiums was a predominately industrial area that has begun transforming into an arts district. The line then crosses Interstate 5 into the residential area of Beacon Hill before it begins to run in the median of Martin Luther King Boulevard. in the Mt. Baker area. This stretch is characterized mostly by low and medium density residential development with some commercial. As the line once again approaches Interstate 5 in Rainier Beach, industrial uses become more prevalent. This continues as the line crosses the Duwamish River and begins to parallel Route 599. The development returns to mostly residential before meeting the rental car area and other airport associated businesses. Once the line crosses over Interstate 5, the Central Link corridor serves a medium

density area with mostly residential development and containing about 6,600 people per square mile. Within a half mile of the line here is a fairly wide range of real estate values. About a third are in the \$300,000 to \$400,000 range and another third are in the \$200,000 to \$500,000 ranges. The median housing value is \$363,000. Renters dominate this area as nearly 63 percent of the 49,000 occupied units are renters versus 27 percent owner occupants.

Figure 7
Seattle Central Link Route Map



Source: Sound Transit

DART Orange Line Extension – Dallas, TX

Length: 14 miles (Downtown to D/FW 25 miles)
Mode: Light Rail
Number of Stations: 6 (12 to downtown)
Year Opened: 2010
Average Weekday Ridership:
Daily Trains: 72
Weekday peak service frequency: 15 minutes
Travel Time: 31 minutes
Fare: \$2.50

The Dallas Area Rapid Transit (DART) is the area transit authority providing bus and light rail service to the City of Dallas and 12 surrounding municipalities. It operates in a region of 6.8 million residents including 1.25 million in the City. With 90 miles of track, DART is currently the largest light rail operator in the United States. DART opened its 20-mile starter system in 1996 and 1997 including the Red Line from West Oak Cliff in South Dallas to Mockingbird Station north of downtown and the Blue Line from Ledbetter in southeast Dallas to Pearl Station downtown. In 2001 and 2002, the Blue line was extended north of Mockingbird to Garland and the Red Line was extended north to Plano, adding an additional 15 miles of rail service.

In 2006, DART received \$700 million in FTA funding toward a total investment of \$2.5 billion to begin construction of the Orange and Green Lines adding an additional 45 miles of LRT and doubling the size of the system. The Green Line opened from downtown south to Fair Park in 2009 and was completed north to Carrollton in 2012. The Orange Line runs concurrent with the Green Line to Bachman Station north of Love Field and branches west of Love Field to DFW, as shown on **Figure 8**.

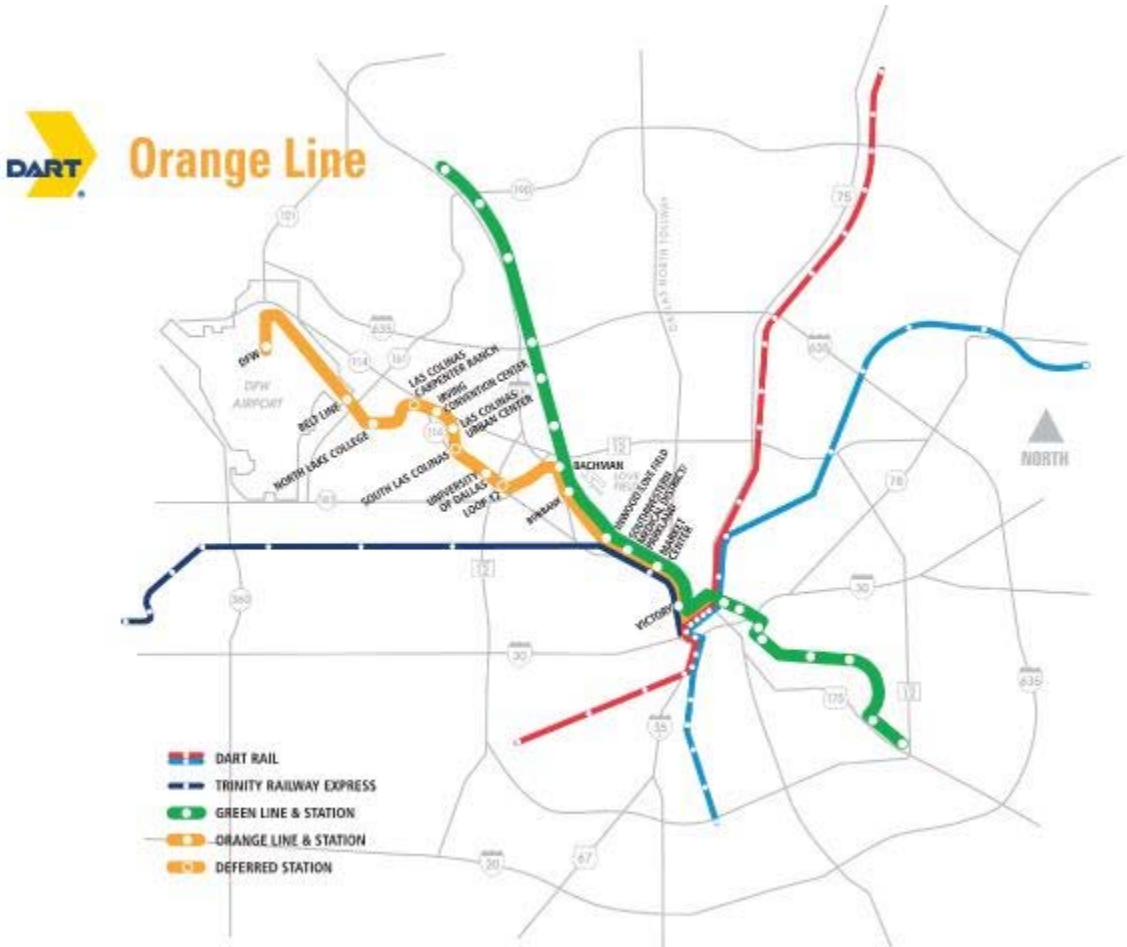
The Orange Line Extension consists of 14 miles of new track and 6 stations connecting to the north end of D/FW at Terminal A. It was not long after construction began in 2006 that budget issues arose with the anticipated cost rising from \$988 million to nearly \$1.9 billion. These overruns threatened to halt the project and it was put on indefinite delay in June 2010, only to be revived later in the year due to cost savings and federal funding through Tiger II. The final station at DFW Airport opened in August 2014.

Corridor Land Use and Market Conditions

The Orange Line Extension begins at Bachman Station, northwest of Love Field, Dallas's central city airport serving Southwest Airlines and the Medical District which includes an area of fairly dense multi-family development. It then heads southwest along Route 482 into Irving. This area is characterized by more industrial uses such as distribution facilities and packaging plants adjacent to the interchange of Routes 114, 183 and 12. Once it meets Route 114, the line begins to head northwest past the University of Dallas, a small, private, Catholic college with about 3,000 students. As it approaches Lake Carolyn, the context shifts back to more residential uses, again mostly multi-family apartment buildings with some offices and commercial uses. As it begins to head toward the D/FW Airport, the line passes through the master planned community of Las Colinas. Its upscale residential areas are popular for corporate relocations due to its proximity to downtown Dallas and DFW. It currently is home to 30 Fortune 500 companies

including Exxon, Verizon and Kimberly Clark. North Lake College, a 10,000 student community college, is also located in this vicinity and is served by a dedicated station. The development finally transitions to mostly airport related businesses as it approaches DFW Terminal.

Figure 8
DART Orange Line



Source: DART

Findings

1. A downtown to airport rail connection is increasingly an important element of the region's transit system

Fifteen years ago, only eight major US cities had a downtown-to-airport rail line. By 2017, at least 20 cities including Denver will have a similar connection. Therefore while the East airport to downtown connection is not a unique element in the regional or national context, it is an essential transit connection that allows Metro Denver to be competitive with other major U.S. regions for business and tourism.

2. The success of an airport line is related to the extent and quality of the transit system and its connectedness to the region.

Based on competitive cities as well as the East Line ridership forecasts, average daily boardings at the DIA rail station are likely to comprise only a small percentage of airport passenger traffic. In addition, Airport boardings destined for downtown are expected to be only a small portion of the line's total ridership. The success of the East Line will therefore be contingent on transit activity at the other seven stations including DIA employee commuting, downtown work trips, and other transit activity on the larger RTD rail system.

3. The East Line has the potential to be one of the best airport to Downtown transit connections in the U.S., giving Metro Denver increased exposure to outside business and tourists through their positive experience.

Travelers will be able to make the connection from DIA to the East Line by walking through baggage claim in the main terminal building and through a hotel lobby directly to the station platform. Service is expected to be at 15-minute intervals during morning, daytime, and evening hours, and the travel time to Union Station is estimated at 35 minutes. Other U.S. airport to downtown connections require connections on rubber tire shuttle buses, walks through parking lots or parking structures, or travel between terminals by monorail or other vehicles, adding to the complexity of the transition. The DIA connection will be world class and similar to systems in major European and other global cities.

4. Transit fares are an important factor in airport related transit ridership.

Although the airport connection is unique, the East Line will operate and function similar to other RTD rail lines in the Denver region. Transit ridership is impacted by multiple socioeconomic factors including age, income, travel time savings, and cost. It is notable that none of the airport lines profiled charge a premium for a trip to the airport and none had a one-way fare exceeding \$3.00. Therefore to maximize ridership, the East Line should be priced and operated like the existing rail lines in the RTD network and not at a differential fare structure based on the DIA connection.

5. TOD and other real estate development on airport property in the U.S. so far have been limited to hospitality and traveler oriented retail, and freight distribution.

Major high quality airport hotel and conference facilities have been built at Dallas-Fort Worth, Denver (under construction), Miami, Orlando, and a number of other cities. At the largest U.S. international and global international airports, substantial amounts of retail space, restaurants, and other services have been added to airport terminals. In the U.S., development outside the terminal has so far been largely freight and airport service related. DFW, for example, has established a large regional distribution hub on airport property. We

have not identified any examples of office-, retail-, or residential-anchored TODs at U.S. airports. Some of this is due to the large footprints of airports and restrictions on the type of development that can occur on property purchased with FAA funds or within a certain distance of runways.

3. *INDUSTRIAL TOD*

East Corridor Context

In many areas the expansion of the RTD rail system, FasTracks, is occurring on existing freight rail rights of way on the Gold, East, Northwest, and North Metro lines. As a result, numerous transit stations and associated development opportunities on the transit system are located on adjacent industrial land. The western half of the East Line travels through built-up industrial areas. In contrast, the East Line travels across larger areas of undeveloped land east of Peoria Station.

Industrial property is a critical economic component to any city or region, providing good paying jobs and key goods distribution and service networks. The strategic location of industrial sites, large parcel ownership patterns, and transportation access surrounding transit stations in industrial locations can create enticing prospects to convert these uses into higher value real estate, including residential, institutional, office, and retail. Thus the evolution, preservation, or conversion of industrial land is an important consideration facing the communities along the East Line corridor and the surrounding region. EPS prepared case studies from three other cities to examine how they have approached either the preservation, attraction, or evolution of industrial development along transit corridors. The key issues that were evaluated are summarized below.

- Can industrial development work in conjunction with other TOD efforts? Should these decisions be made at a station level or in reference to the entire system?
- What types of jobs are attracted to industrial space and industrial districts, and are these compatible with transit-oriented development?
- What land use and economic development policies and strategies have been used to either preserve or expand industrial and other living wage employment opportunities?

This section examines the following three case studies to provide examples of how other cities have approached these issues, and to illuminate some of the challenges and opportunities of industrial TODs:

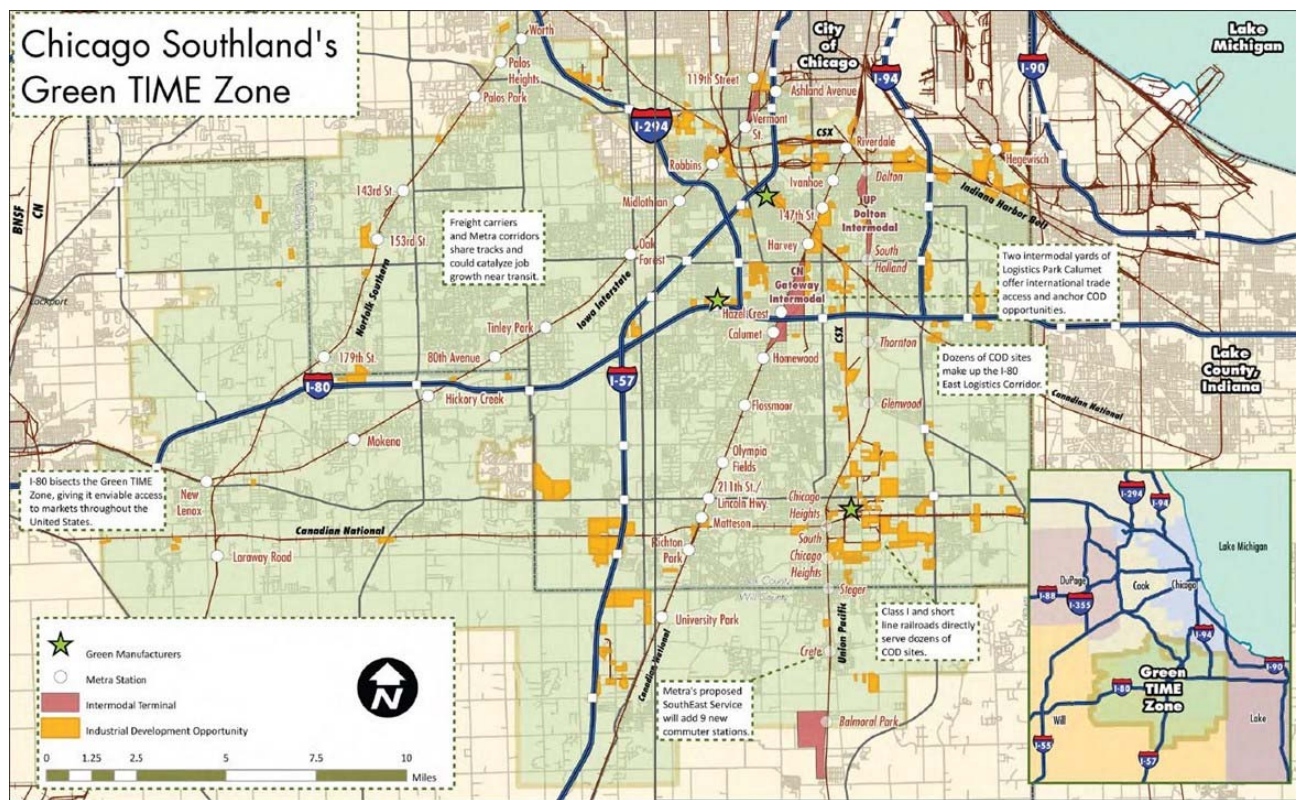
- Chicago Green TIME Zone, Chicago-Southlands
- LA Cornfields Arroyo Specific Plan, Los Angeles
- Eastern Neighborhoods Plan, San Francisco

Chicago Green TIME Zone, Chicago-Southland



Beginning in the 19th century, the smaller suburbs of Chicago evolved to combine residential commuter communities and industrial hubs around the extensive rail and highway transportation networks that converged in the region. As the United States grew into a manufacturing power, these industrial hubs provided many steady blue collar jobs, and residential communities expanded in conjunction with their success. Over the last 60 years, however, the erosion of the region's industrial base and the transformation to a more service-based economy led to a pattern of decline and disinvestment in many of these communities. In 2004, the 42-member municipalities of the South Suburban Mayors and Managers Association (SSMMA), along with the Center for Neighborhood Technology (CNT) and several other non-profit organizations, embarked on a six-year planning effort to revitalize the area. This culminated in the 2010 Chicago Southland Green TIME Zone plan.

Figure 9
Chicago Green TIME Zone Map



Program and Process

The planning effort began by identifying key assets common to the communities. These characteristics are also common to many neighborhoods and first-ring suburbs in older American cities, giving this plan broader relevance. However, they are particularly prevalent in the Southland, and fundamentally informed the initial thinking about the correct planning approach. The most important assets identified include:

- **Exceptional transportation assets** – Freight and transit lines, intermodal terminals, and expressways all intersect in this area.
- **Location efficiency** – Household transportation savings and fuel savings for shippers and distributors.
- **Underutilized land** – 4,000 acres of vacant or underutilized land for mixed use and cargo-oriented development.
- **International logistics access** – Canadian National and Union Pacific railroads connect to Canada, Mexico and numerous deep water ports.
- **Green supply chain** – 450 companies and 10,000 workers ready to shift into production of green and other emerging technologies.
- **Workforce readiness** – More than 66 percent of residents in the core area of the Green TIME Zone hold a high school or community college diploma.

The Plan addresses two fundamental challenges with one cohesive strategy: 1) abandoned industrial and redeveloping land, and 2) a jobs-housing mismatch. Rather than completely reimagining the area, the favored approach called for restoring the vast tracts of abandoned brownfields. The surrounding rail and intermodal freight infrastructure could reinvigorate economic activity and provide many low and mid-skilled jobs closer to where people live.

Outcomes

To guide these redevelopment efforts, the resulting Green TIME Zone plan (December 2010) relies on three interconnected approaches:

- **TRANSIT**-oriented development (to shape livable communities);
- Cargo-oriented development (to capitalize on **INTERMODAL** freight movements); and
- Green **MANUFACTURING** (to engage emerging and sustainable economic trends).

Finally, each of these approaches is grounded in a commitment to protect the ENVIRONMENT.

The Green TIME Zone plan's goals include attracting 13,400 jobs, \$2.3 billion in new income, and \$232 million in state and local tax revenue to the area over the next ten years. Ongoing efforts to achieve these goals include seeking assistance and investment from various federal, state, regional, and local agencies. Specific areas of emphasis include brownfield clean up and environmental remediation, transportation planning, economic development, housing stabilization and livable neighborhood grants, and workforce development initiatives.

Figure 10
Green TIME Zone Strategic Overview



Cornfields Arroyo Specific Plan, Los Angeles

Approximately one mile northeast of downtown Los Angeles, California, the three neighborhoods of Lincoln Heights, Chinatown, and Cypress Park have been the subject of this six-year planning effort. The Cornfields Arroyo Specific Plan (CASP) defines policies and strategies to transform an industrial area into a more livable, mixed use area while still protecting jobs and attracting green and “clean-tech” businesses. CASP originated because the City recognized that several adjacent planning efforts were likely to impact this area as the neighborhood gained in popularity. Other than the few affordable housing projects built in the area prior to the planning effort, much of the land in the CASP plan was zoned for industrial use.



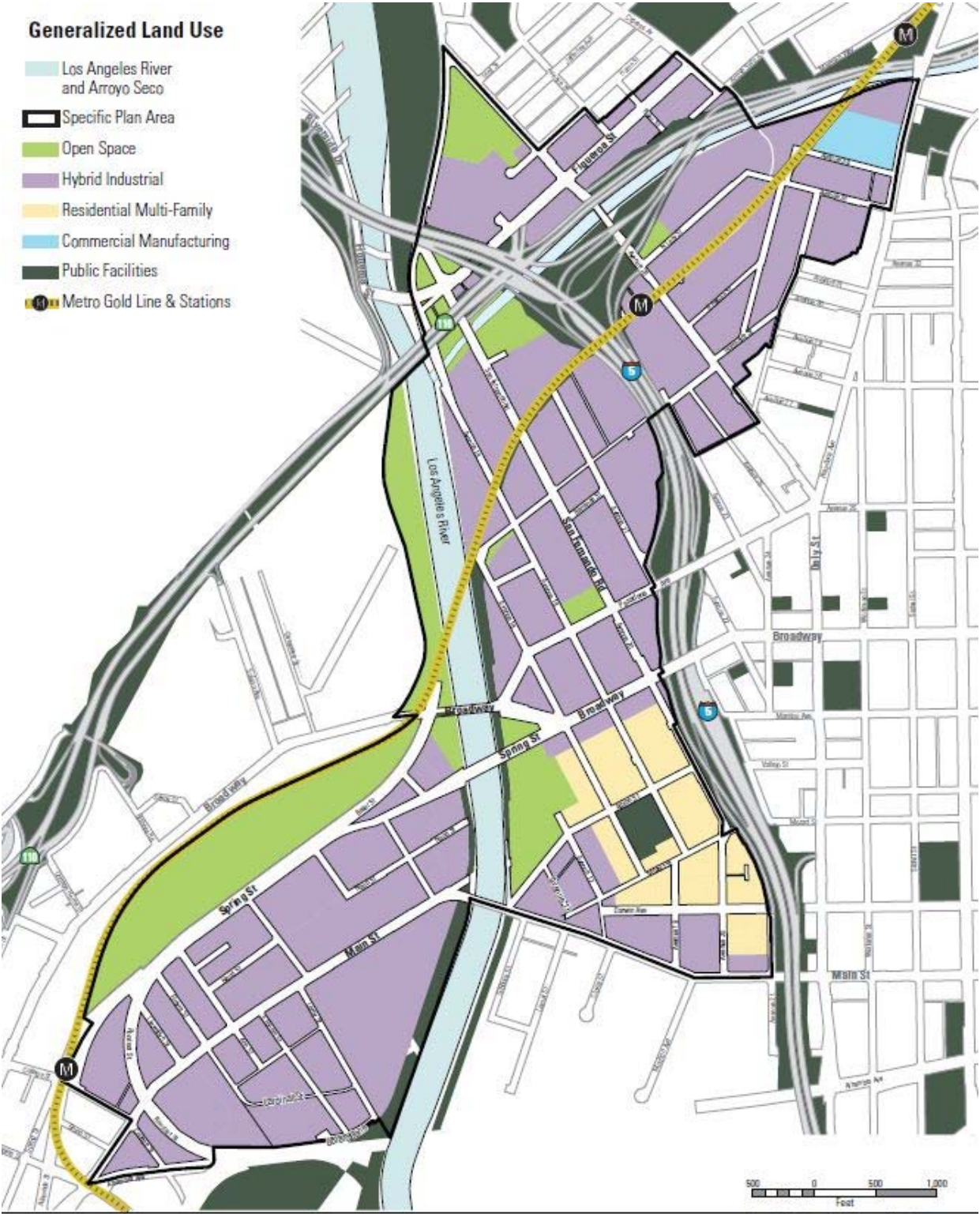
- The **LA Metro Gold Line** was completed in 2003, connecting Pasadena to East Los Angeles via downtown. The CASP area includes two Gold Line stations and is adjacent to a third.
- In 2006 the 32-acre **Los Angeles State Historic Park** opened on a former industrial site and rail station. The park forms part of the western boundary of the CASP study area.
- After a decade of work, the **Los Angeles River Revitalization Master Plan** was completed in 2007, providing a blueprint for transforming 32 miles of concrete-lined river into green public spaces better connected to adjacent neighborhoods, including those in the CASP area.

These three projects redefined the area and resulted in increased residential development pressure. The city decided to act proactively and avoid a multitude of residential spot zoning requests in the area. Starting in 2007, the CASP planners began working with the community to ensure this development could be absorbed while upholding the city’s long-standing policy of “supporting industrial and employment generating land uses.”

Program and Process

From the beginning of the planning effort, city staff recognized that this area would need to integrate this substantial new residential development while somehow managing to preserve opportunities for existing and future businesses to thrive and grow in the area, keeping jobs within the city. Finding ways for these uses to mix either vertically or horizontally was a key component of the plan. The city recognized that the nature of industrial uses is changing (especially in the urban core) and that this increasingly makes them more compatible with residential and other mixed uses. Other economic development efforts in Los Angeles were promoting the idea of a “Clean Tech” corridor, and this work further influenced the thinking about how to successfully target industries and jobs within the CASP area.

Figure 11
Los Angeles Cornfields Arroyo Specific Plan Land Use Map



Outcomes

The CASP plan was approved in 2013 and is projected to attract more than 25,000 new residents over the next 25 years. The plan addresses this expected increase in residential uses by creating four new zoning districts, each of which emphasizes residential, commercial, and industrial uses to varying degrees:

- **Urban Village** zones have a more residential focus – up to 90 percent residential is allowed. These zones are generally located in close proximity to the park. A 3.0 base Floor Area Ratio (FAR) limit is in place unless affordable housing is included.
- **Urban Innovation** zones target the preservation and growth of jobs in the area. Up to 100 percent industrial uses are allowed, but the zoning will accommodate up to 15 percent residential, and between 10 and 15 percent commercial, with a range of 3.0–4.0 FAR.
- **Urban Center** zones are generally areas near or around the three Metro stops. They are more regionally focused with an emphasis on jobs and commercial uses, and allow more density with up to a 6.0 FAR.

The plan also created a new land use designation called “Hybrid Industrial.” The goal of the Hybrid Industrial designation is to regulate the activities of businesses that can successfully coexist with the residential uses in the area. However, rather than defining those business by use category, the city decided to utilize performance standards that regulate such things as air and noise pollution, maintenance and delivery schedules, and storage and vibration standards. These performance standards are based heavily on existing city ordinances, so as to be as consistent as possible with other regulations developers and businesses might encounter elsewhere in the city. To allow more flexibility in the future, the city chose not to limit actual use types because many industries might eventually become clean(er) and fit well within the urban fabric of this type of neighborhood.

Eastern Neighborhoods Plan, San Francisco

Over the last fifteen years, the Eastern neighborhoods of San Francisco (The Mission, Central Waterfront, East South of Market (SOMA), and Potrero Hill/Showplace Square) have

EASTERN NEIGHBORHOODS Community Planning

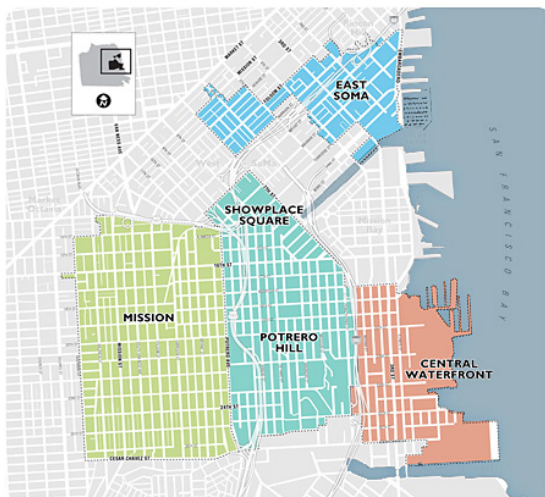


Figure 12
Eastern Neighborhoods Map

seen an increasing number of land use conflicts as the nature of the area changes. Much of San Francisco’s industrial land is found in these neighborhoods, but as development expanded from downtown, residential and office uses started vying with industrial uses for space. Based on its 2002 study of industrial lands in the San Francisco area, the city recognized the value of protecting the Production, Distribution, and Repair (PDR) employment typically found in these neighborhoods and set about creating a plan to balance job preservation by accommodating the burgeoning residential and office growth. While there was no

specific transit catalyst in this plan, the opening of Phase 1 of the MUNI T Third line in 2007 connected the length of the eastern portion of the Central Waterfront neighborhood into the MUNI system. The construction of Phase 2 (present-2017, opening to the public in 2019) adds further transit orientation in East SOMA.

Program and Process

The plans focus on three main strategies. First, Area Plans were developed for each neighborhood to direct the long-term vision and development, specifically for issues like housing needs, job protection, transportation, and community amenities. Second, the city created zoning to balance the needs of newer residential and office development with the existing PDR uses, and had to anticipate how development might evolve in the future. Four main zoning categories were developed:

- **Residential Zones:** to maintain and protect areas currently zoned to residential.
- **PDR Zones:** Intended to protect existing and future PDR uses by prohibiting new residential uses and limiting new office, retail, and institutional uses. This zoning allows existing non-PDR uses to stay in place.
- **Mixed-use Zones:** There are multiple variations of this zoning type, designed to match the differing needs of each neighborhood, emphasizing commercial, residential-retail mixed-use, or PDR uses as appropriate.
- **Special Use Districts:** These two districts will promote “emerging new technology and medical related businesses.”

Finally, a special focus on public amenities and affordable housing constituted an important aspect of each plan. Recognizing that increased residential and office uses will intensify the need for community facilities like transit, bike and pedestrian access, and parks and open space, each plan provides both funding and implementation strategies to ensure these needs are met within each community.

Outcomes

The *Eastern Neighborhoods Community Plan*, consisting of the four neighborhood Area Plans and the new zoning designations and map were adopted in January of 2009. The City, with input from the Citizens Advisory Committee, is now working on the more detailed aspects of how to implement the various features of the *Community Plan*. Challenges include:

- Preserving the PRD employment base within the Eastern Neighborhoods;
- Encouraging low cost innovation districts; and
- Encouraging “micro-industrial” uses.

The City is also exploring strategies such as zoning amendments and incentives for increasing utilization rates (employment density) of larger buildings that often have a high proportion of unused or rarely used space, allowing them to more easily share the space with smaller companies. For newer buildings, the City also designed the Small Enterprise Workspace (SEW) zoning for a “single building that is comprised of discrete workspace units which are independently accessed from building common areas.”

While the Planning Department staff indicated that the plans have been more successful in preserving PDR jobs in the area, they feel they have been less successful thus far at encouraging low cost innovation districts. Several new strategies implemented or under consideration include reduced impact fees on PDR uses; allowing accessory retail square footage for certain PDR uses; and the Innovative Industries Special Use District, which is intended to provide affordable office space to small firms and organizations “engaged in innovative activities, incubator businesses, and microenterprises.” The city also examined the possibility of an inclusionary office/PDR ordinance (similar to an Inclusionary Housing Ordinance (IHO)) but found that the numbers did not quite work. Finally, they are working on tax breaks that would help lower the cost of buying buildings within the PDR zones in order to encourage new and emerging businesses to locate there.

San Francisco is justifiably renowned for its start-up culture, but this strength goes beyond the famous technology companies. There is also great momentum in “micro-industrial” uses such as food and beverage production (Vodka distillation and artisanal granola, for example) and design/prototyping/ small-batch manufacturing units (like Timbuktu). These types of businesses are especially important in the context of the Eastern Neighborhoods (and industrial TODs more generally) because their smaller scale allows them to be less land and space intensive, have higher employment density, and thus have better synergy with transit. These businesses are good candidates to take advantage of previously-mentioned strategies like shared building spaces, Small Enterprise Workspace zoning, and accessory retail outlets.

Findings

1. *Jobs and industrial development strategies along rail transit corridors should consider traditional assets and be linked to a region's economic development strategy.*

The ability of a transit corridor to attract jobs and economic development is a function of its region's competitiveness for the targeted industries and the physical and locational assets present at a selected station on site. The plans profiled in this report show cities leveraging or repositioning their existing economic assets to attract jobs rather than targeting completely new industries or markets. The Chicago Green Time Zone plan aligns its economic development strategy with the strong surface transportation network comprised of highways and freight rail that made that region a manufacturing and distribution center, and the manufacturing-oriented labor force present along the corridor. The area around Cascade Station at Portland International Airport (Oregon) has attracted several Oregon-based manufacturers including tool, footwear, audio equipment, and aerospace component makers.

2. *In some station areas it is appropriate to limit the types of industrial uses allowed. More flexibility can be allowed between stations, or outside the quarter mile station area walking distance.*

The Chicago Green Time Zone plan recognizes that industrial development and operations requiring large sites, and truck, and freight rail interactions are generally not compatible with station area transit oriented development. The plan recommends focusing mixed use TOD at the stations and allowing the heavier industrial uses to be located further from the stations.

The City of Los Angeles is using performance based zoning along the Gold Metro line to allow the market to dictate which types of industrial uses can be developed close to transit stations and housing based on their impacts to noise, odor, lighting, deliveries, and other nuisance factors. There is more flexibility on allowable uses between the stations. In cases where jobs need to be located further from the station, there should be a greater emphasis on area-wide first and last mile connections.

The City of San Francisco explored the use of multiple zoning strategies and incentives to spur the creation of low cost industrial and service space within the City to create more opportunities for start-ups and micro enterprise. This effort, however, had limited success due to the underlying high cost of real estate due to competition from residential and office development.

3. *A proactive role by a city or urban renewal authority in planning, infrastructure investment, land assemblage, and public-private partnerships can have a large impact on development.*

Cascade station at Portland International Airport is an example of how a City or urban renewal authority can lead the market with area wide infrastructure investments, sharing of risk, flexibility, and through well executed public-private partnerships. The Portland Development Commission (PDC) purchased several hundred acres of land from the Port of Portland for eventual retail and airport hospitality development at Cascade Station and for broader industrial and office development within the 1,200-acre URA it created east of the

airport along the Columbia River. PDC invested heavily in improving road, transit, and non-motorized trail connections in the area to connect businesses with each other, the surrounding neighborhoods, and to the airport. After several years of stalled development, PDC was willing to work with development partners to revise the planning requirements for the station area property so that the plan reflected market realities. As a major land owner, PDC had the ability to shape development according to public policy goals, including tying living wage requirements to new employment development on PDC-owned land.

4. *Industrial, production, and startup or innovation firms engage in a wide variety of activities with correspondingly diverse building and location needs.*

The case studies as well as observations in the Denver market and along the East Corridor show that “industrial jobs” encompasses a broad array business types with different space needs. In addition, start-up firms, not only in technology but also those in creative industries and in the design and manufacture of high value limited production goods, are increasingly seeking building space in urban industrial and mixed use areas. Many creative industry firms and high value limited production goods firms look for space in an environment that reflects creativity and authenticity, and is at the same time less costly than a central business district while being nearly equally well located. These are typically historic or older industrial areas frequently located around the edges of central business districts or near ports or rail hubs. They often have rail access as well as good highway and road access, which also makes them suitable for heavier industrial businesses. The 38th and Blake station area on the East Line is an example of this kind of area.

Due to the value of their services or goods produced and the labor force skill levels required, these firms often have higher revenues and wages and can afford to pay for more expensive space. Over time, these firms bid up the cost of real estate in what become former industrial districts, displacing lower value added industrial users to lower cost locations.

Many traditionally defined industrial businesses have larger site needs to allow more efficient freight movement or equipment storage and larger building needs. In addition, some of their activities may create a nuisance or conflict with transit station operations. While they may benefit from transit access, they have fewer employees per square foot of building than the higher value firms described above therefore support fewer transit riders. The three case studies in this report show a strategy of locating these uses further from the stations or between stations, which is also applicable to the 38th and Blake, Colorado, and Peoria stations on the East Line.

5. *Connectivity is a critical factor in establishing innovation districts and more broadly for improving access to industrial jobs.*

Part of the success of older industrial districts that have evolved into creative hubs or high value limited production manufacturing districts is due to their connectivity with central business districts and surrounding neighborhoods. These areas, often developed before World War II, frequently have a smaller block structure and a connected street grid, compared to modern truck-based industrial districts with large blocks and arterial roadways and highways. The finer grain development pattern of older industrial districts is more human in scale and allows better bicycle and pedestrian access which is a location factor for the creative workforce and the younger workforce.

As heavier industrial businesses move from older industrial districts and away from transit station areas their access to transit decreases. In order to provide some transit benefit to these businesses, additional investment in first and last mile connections and street connections are needed.