BROADWAY CORRIDOR
TOD GUIDELINE

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INTRODUCTION 1

INTRODUCTION

The Broadway Corridor Transit-Oriented Development (TOD) Guideline will be a guide for Redwood City to maximize the benefits of a streetcar system and support economic development and transit ridership along Broadway Street. Redwood City envisions a streetcar system as a long-term community asset to enhance connectivity and mobility for their residents and to enhance regional and local transportation network. The successful outcome of a streetcar system does not solely depend on the transit system itself. The City will need to develop a guideline that contains thoughtful planning and design process for mobility and access to the future streetcar system, parking and travel demand management, land uses, and walkable environment. The TOD Guideline will be consistent with the City's vision and goals set forth in the General Plan to create a compact, mixed-use development along Broadway Street and support multi-modal transportation network (see Figure 1).

Figure 1. Multi-modal transit-oriented development with a streetcar system. (Source: Mithun, 2014).

RELEVANCE TO PLANNING

Transportation and land use are recognized as major components in the field of city and regional planning. Since the industrialization in the late 1800's, automobiles have become

the most utilized travel mode for most Americans. In accordance with high automobile-dependency and the advancement of technology and transportation infrastructure, urban sprawl has become the dominant land use pattern over the years (see Figure 2). The American Dream of owning a house on a large lot became evermore popular, and the skyrocketing property values and urban blight in city centers caused families to migrate towards city edges and suburbs.

Figure 2. Urban sprawl with large lots (Source: Corbis Images, n.d.).

The once idealistic suburban life style and preference of single-occupancy vehicles have resulted in environmental, economic, and equity issues in many cities. Communities are facing negative consequences including congestion, high transportation and infrastructure costs, economic disparity, decreased public health, and low air quality, to name a few. As cities are recognizing the urgency to transform lifestyle and development patterns, transit-oriented development (TOD) have been steadily accepted as a potential solution that

encourages sustainable community development. TOD is a walkable, compact, moderate- to high-density development located within a comfortable walking or bicycling distance to transit shelters.TOD emphasizes location efficiency by providing a mix of housing, retail, employment, and public amenities within a close proximity to public transportation to encourage people to live, work, and play without depending heavily on private vehicles (see Figure 3).

American Planning Association defines planning as improving “the welfare of people and their communities by creating more convenient, equitable, healthful, efficient, and attractive places for present and future generation” (n.d.). TOD’s principles are directly in alignment with planning as this approach has an overarching goal of improving the quality of life and creating a more livable place for communities.

Disclaimer:
The TOD Guideline is a supplement document to the two-quarter studio courses CRP 410 and CRP 411. This document builds on the information and knowledge gathered from the two courses and incorporates field survey and research results relevant to the specific topic of transit-oriented development.

Figure 3. Transit-oriented development with compact development and walkable environment. (Source: Crandall Arambula, 2014).

LITERATURE REVIEW 2

HISTORICAL CONTEXT

Prior to defining transit-oriented development (TOD) and focusing on its principles and elements, it is important to understand the historical context, patterns of population movement, and development of transportation modes in which TOD has evolved.

THE GREAT MOVEMENTS OF AMERICA

According to Lewis Mumford (1968), America has experienced three great movements of population in just a little more than a century (p. xi). He also predicted that America would be dominated by a fourth migration throughout the rest of the twentieth century. These movements are referred to as internal migrations that contributed in shaping the growth patterns and America's landscape today.

The first migration was the clearing of the continent and disposal of good free lands. Refugees from Europe and pioneers cleared the landscape of America for farmland and staked out railway lines. Consequently, little communities clustered around mines or railways (Mumford, 1968) (see Figure 4).

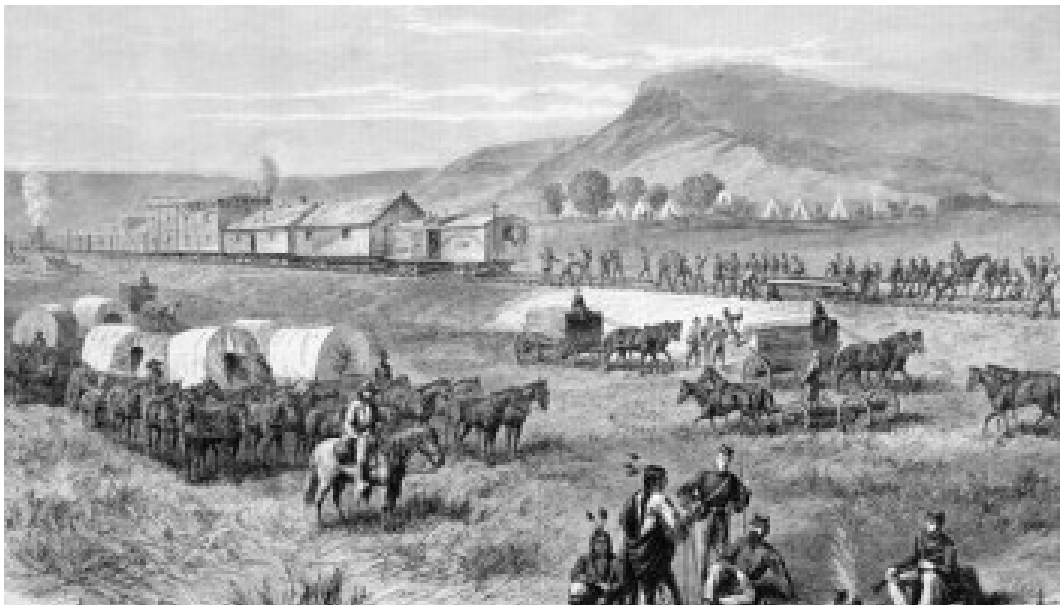

Figure 4. Railroad building on Great Plans of America. (Source: Superstock, n.d.)

The second migration was movement of people from countryside into factory towns. With the introduction of steam power, factories were erected in places where power was most available. Industrial towns rapidly grew in cities such as Cleveland, Columbus, and Chicago. Cities were considered as a place of work, and people sought business opportunities. Open spaces for children to play and grow and community amenities for families were not a priority for men who were focused more on the new industrialism. As a result, homes were blocked and crowded by factories, rivers were polluted, and living condition worsened with unsanitary environment (Mumford, 1968) (see Figure 5).

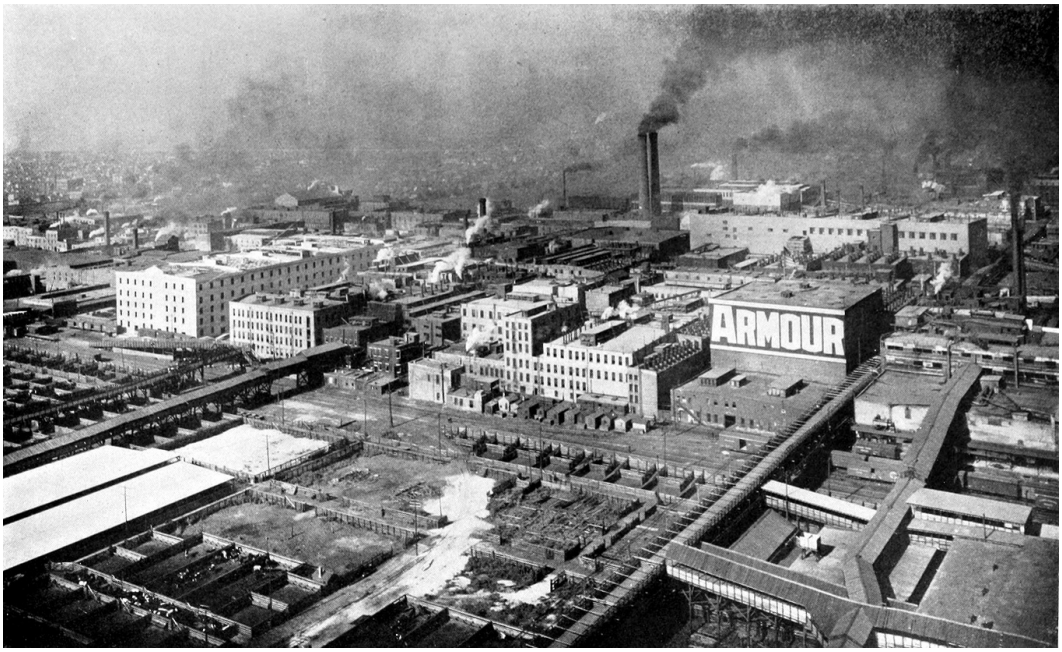

Figure 5. Factory town in Chicago, IL. (Source: Sometimes Interesting, 2013).

The third migration focused on financial centers that began from the great consolidations of industry that began in the eighties to the growth of banking and insurance facilities in the nineties and lastly to the development of advertising for the purpose of securing a national market. New York attracted the most population with greatest concentration in all these departments and regional sub-metropolises emerged with population of more than five hundred thousand. Popular cultural resources such as art museums, libraries, and universities began to grow as by-product of economic prosperity (Mumford, 1968).

Mumford (1968) predicted in his book that technological revolution will be the main force in driving the fourth migration in the twentieth century – “a revolution which has made the existing layout of cities and the existing distribution of population out of square with our new opportunities,” and he was right (p. xvi). The invention and popularity of automobile shifted people’s preference in means of rapid transportation. Unlike railroads, automobile made lands previously untouched by the railroad accessible and increased the radius of market and service areas. Railroads tended to concentrate growth while automobiles dispersed population (Bruegmann, 2008, p. 107) (see Figure 6).

Figure 6. Automobiles and expanded infrastructure disperse population. (Source: Wikipedia, n.d.)

In addition, infrastructure expansion spurred even more growth and movement of population. American cities began the process of paving streets and sidewalks, installing curbs, gutters, streetlights, and sewers, which provided for a complete package of urban transportation amenities (Bruegmann, 2008, p. 38). Moreover, federal and state governments started investing heavily on the expansion of highway system in many cities, constructing and planning for a national superhighway network, known as the interstate highway system (see Figure 7).

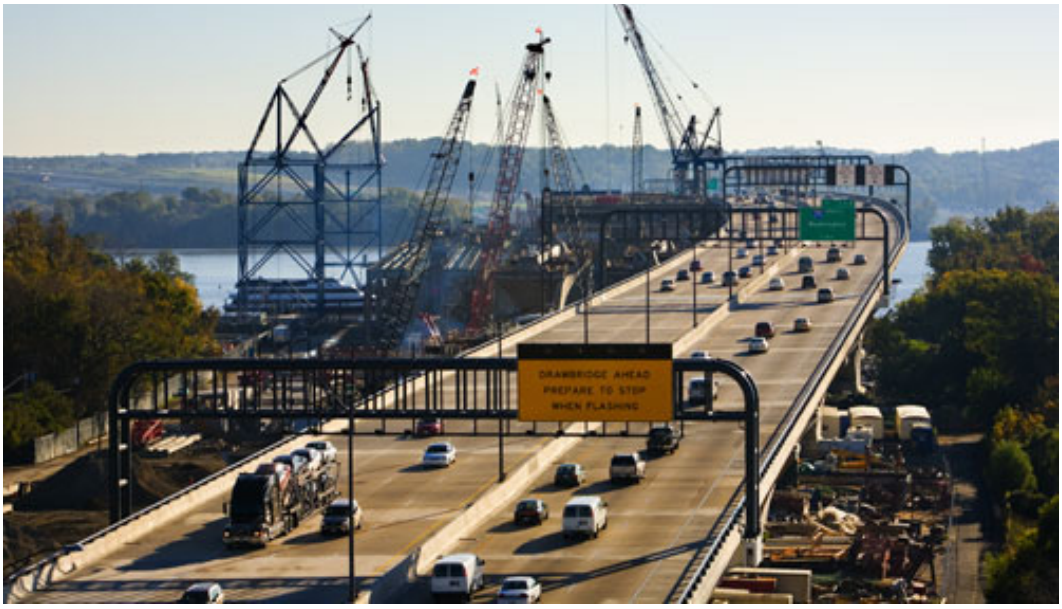

Figure 7. Interstate highway investment and expansion. (Source: CCJ, 2011).

Figure 8. Single-family homes in urban sprawl. (Source: Co.Design, 2014).

Although transportation is not the sole cause of decentralization and urban sprawl in American cities, it is one of the major driving forces in addition to population increase and unprecedented affluence. According to Bruegmann (2008), “unprecedented levels of affluence and rising automobile ownership allowed a large portion of the American urban population, including even a substantial percentage of blue-collar families, to have the option of living in single-family detached houses in the suburbs” (p. 36) (see Figure 8). Although public transportation such as urban rail systems, streetcars, and buses were not completely abandoned, automobile allowed people to shift from mass transportation to a more convenient individual mode of transport. Mass production of automobiles and increased affordability gave middle-class citizens “the kind of privacy, mobility, and choice once only available to the wealthiest citizens” (Bruegmann, 2008, p. 45).

THE NEW TREND

Fishman (2005) took a longer view comparable to Mumford’s great migrations in the 1920’s. He predicted that the fourth migration to suburbia is now diminishing, and a fifth migration is now underway with the reurbanization of inner-city districts (p. 358). This new movement is “essentially the rediscovery and re-creation of the traditional urbanism of density . . . with the presence of relatively cheap housing close to downtown regional employment centers and accessible to the suburbs as well” (p. 359). Urban elements that drove the fourth migration to suburbs–pedestrian scale, resistance to the automobile, aging housing stock, obsolete retail and manufacturing facilities, reliance on mass transit, minority and immigrant populations–are attracting people back into inner cities (see Figure 9).

Interestingly, Belzer and Autler (2002) also identified three major trends that characterize metropolitan America at the beginning of the 21st Century, in alignment with Fishman’s vision of the fifth migration. The first trend is the resurgence of investment in America’s downtown areas. As Fishman stated, this trend show that people are moving back to cities, and “urban centers are once again seen as attractive, lively places to live and work, and as centers of intellectual and creative capacity” (Belzer & Autler, 2002). The second trend is the continuing growth and emerging maturity of America’s suburbs, many of which are struggling to become cities in their own right. Suburbs are experiencing more pressure

Figure 9. Reurbanization of downtown Los Angeles. (Source: Destination Southern California, 2014).

of rapid growth with the growing problem of traffic congestion and the need to diversify land uses. While suburbs are increasingly vital, they are also increasingly challenged to become more than bedroom communities. The third trend is the most significant, which is a renewed interest in transit use and transit investment (see Figure 10 and Figure 11). According to Belzer and Autler (2002), every major American city is planning some type of urban rail or rapid bus system, and states are collaborating to plan and build high-speed rail systems linking metropolitan regions across the country.

Figure 10. Renewed interest in streetcar transit. (Source: Colorado Springs Trolleys, n.d.).

Figure 11. Renewed interest in Bus Rapid Transit as a transportation mode. (Streetsblog NRC, 2009).

At the realization of unsustainable growth patterns and socioeconomic consequences, America's demand for a new form of development and transportation is increasing, and "a substantial market exists for a new form of walkable, mixed-use urban development around new rail or rapid bus stations and transit stops" (Belzer & Autler, 2002). Demographic trends are changing, which is causing fundamental shifts in the housing market. Baby-boomers are aging, and household size is shrinking. People's lifestyles are also changing with preference in convenience and affordability: today, people want a room with a view within walking distance of coffee, restaurants, yoga, a dog park, art, and culture rather than large lot homes in suburbs with high housing and transportation cost and traffic congestion. In the midst of this shifting demand and trend is the transit-oriented development, which Peter Calthorpe (1993) envisioned as "a new paradigm of development; a new vision of the American Metropolis and a new image for the American Dream" (p. 15).

WHAT IS TOD?

Today, transit-oriented development (TOD) is a widely used term that conveys the idea of land use development along or near public transportation. There is no single definition that represents the concept of TOD; however, the term is defined in various forms in the literature, and all share common characteristics. Cervero, Ferrell, and Murphy (2002) compiled definitions from various literatures in their literature review, Transit-Oriented Development and Joint Development in the United States:

- "The practice of developing or intensifying residential land use near rail stations" (Boarnet and Crane 1998A).
- "Development within a specified geographical area around a transit station with a variety of land uses and a multiplicity of landowners" (Salvensen 1996).
- "A mixed-use community that encourages people to live near transit services and to decrease their dependence on driving" (Still 2002).
- "A compact, mixed-use community, centered around a transit station that, by design, invites residents, workers, and shoppers to drive their cars less and ride mass transit more. The transit village extends roughly a quarter mile from a transit station, a distance that can be covered in about 5 minutes by foot. The centerpiece of the transit village is the transit station itself and the civic and public spaces that surround it. The transit station is what connects village residents to the rest of the region… The surrounding public space serves the important function of being a community gathering spot, a site for special events, and a place for celebrations-a modern-day version of the Greek agora" (Bernick and Cervero 1997, p. 5).
- " Moderate to higher density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment, and shopping opportunities designed for pedestrians without excluding the auto. TOD can be new construction or redevelopment of one or more buildings whose design and orienteation facilitate transit use" (California Department of Transportation 2001).

Although such definitions vary in scope and specificity, they are commonly based on Peter Calthorpe's definition in his book, The Next American Metropolis: Ecology, Community, and the Amercian Dream. Calthorpe is a pioneer in the field of TOD as he was the first

person to develop the concept of TOD. For that reason, his book is the centerpiece of today's national policies and best planning practices in TOD. Calthorpe (1993) defines TOD as "moderate and high-density housing, along with complementary public uses, jobs, retail and services, are concentrated in mixed-use developments at strategic points along the regional transit system" (p. 41).

The following excerpt from Calthorpe's book (1993) illustrates TOD in detail and the overarching benefits in a regional scale:

> *The alternative to sprawl is simple and timely: neighborhoods of housing, parks, and schools placed within walking distance of shops, civic services, jobs, and transit – a modern version of the traditional town. The convenience of the car and the opportunity to walk or use transit can be blended in an environment with local access for all the daily needs of a diverse community. It is a strategy which could preserve open space, support transit, reduce auto traffic, and create affordable neighborhoods. Applied at a regional scale, a network of such mixed- use neighborhoods could create order in our balkanized metropolis. It could balance inner-city development with suburban investment by organizing growth around an expanding transit system and setting defensible urban limit lines and greenbelts. The increments of growth in each neighborhood would be small, but the aggregate could accommodate regional growth with minimal environmental impacts; less land consumed; less traffic generated, less pollution produced. (p. 16)*

TOD PRINCIPLES

The Institute for Transportation and Development Policy (ITDP) developed a modern version of TOD principles, which are based on the organization's research and experience in sustainable communities and transport. ITDP outlines the principles in The TOD Standard to guide development of TODs for a broad range of urban development stakeholders, including policy makers, developers and investors, planners and designers, sustainable development advocates, and interested citizens. The following list identifies ITDP's principles and objectives of transit-oriented development:

1. WALK: Develop neighborhoods that promote walking:
- Objective A: The pedestrian network is safe and complete.
- Objective B: The pedestrian realm is active and vibrant.
- Objective C: The pedestrian realm is temperate and comfortable.

2. CYCLE: Prioritize non-motorized transport networks:
- Objective A: The cycling network is safe and complete.
- Objective B: Cycling parking and storage is ample and secure.

3. CONNECT: Create dense networks of streets and paths:
- Objective A: Walking and cycling routes are short, direct and varied.
- Objective B: Walking and cycling routes are shorter than motor vehicle routes.

4. TRANSIT: Locate development near high-quality public transport:
- Objective A: High-quality transit is accessible by foot.

5. MIX: Plan for mixed use:
- Objective A: Trip lengths are reduced by the provision of diverse and complementary uses.
- Objective B: Short commutes for lower-income groups.

6. DENSIFY: Optimize density and transit capacity:
- Objective A: residential and job densities support high-quality transit and local services.

7. COMPACT: Create regions with short commutes:
- Objective A: The development is in an existing urban area.
- Objective B: Traveling through the city is convenient.

8. SHIFT: Increase mobility by regulating parking and road use:
- Objective A: The land occupied by motor vehicles is minimized (see Figure 12).

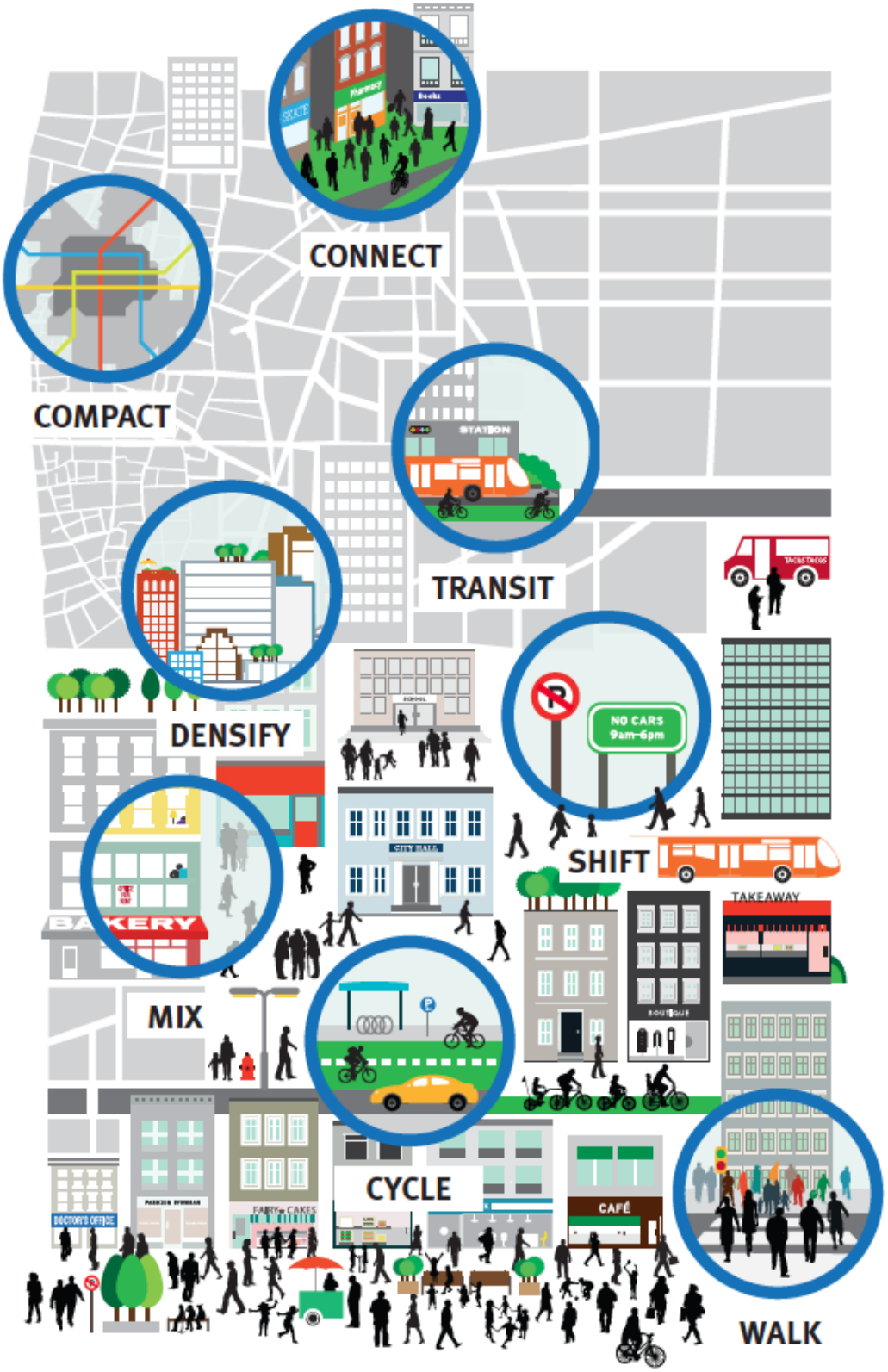

Figure 12. Institute for Transportation and Development Policy's TOD principles diagram. (Source: ITDP, 2014).

CASE STUDIES 3

PORTLAND STREETCAR & TOD IN PORTLAND, OR

Background

The Portland Streetcar is one of the most successful transit systems in the United States that led to the dramatic revitalization of its downtown core (see Figure 13). In the 1960's, Portland experienced loss of residents, businesses, and capital due to the suburbanization of housing developments, shopping centers, and business parks (Portland Streetcar, n.d.) (see Figure 14 & Figure 15). Realizing the need for a solution that can spur economic development and accommodate residential and business growth in the inner city, the City initiated the Streetcar Feasibility Study and established the Streetcar Citizens Advisory Committee in 1990. The Portland Streetcar opened in 2001 with the first modern streetcar system in North America. Since then, the city continually expanded their streetcar system and emphasized transit and cooperative planning for transportation and land uses (Portland Streetcar, n.d.).

Figure 13. South Auditorium & Downtown in Portland, 1963. (Source: Vintage Portland, 2010).

Figure 14. Portland's blighted residential area in South Auditorium before urban renewal. (Source: Vintage Portland, 2010).

Figure 15. Portland Streetcar in the Pearl District. (Source: Travel Portland, n.d.).

Portland also has the most aggressive transit-oriented development (TOD) program in the nation (Transportation Research Board [TRB], 2004). The City placed TOD as the basis for their policy framework and implementation tools to maintain urban form, reduce dependence on the automobile, and support reinvestment in centers and corridors. TOD planners developed financial incentives to attract private market and developers to invest in transit areas and achieve higher densities, better urban design, reduced parking, and greater housing affordability. As a result, the City's Central Business District experienced a significant shift in the density and location of new development, strengthened economic vitality, provided sustainable and affordable living options, and increased mobility and accessibility for businesses and residents (see Figure 16).

Figure 16. Portland Streetcar and transit-oriented development. (Source: Insider Louisville, 2013).

Streetcar System

The City of Portland initiated the Portland Streetcar to connect two major redevelopment areas: the River District just north of Downtown and the South Waterfront District located at the opposite end of Downtown. The River District had 70 acres of abandoned rail yards

and a contaminated brownfield site, which represent underdevelopment and blight. The South Waterfront District contained 128 acres of underutilized land with largely vacant industrial parcels that required environmental remediation. The goals of the Portland Streetcars have remained consistent since the opening on July 20, 2001:

- Use a commitment to a high quality transit service as an incentive for high-density mixed-use development within the Central City. Link neighborhoods with a convenient and attractive transportation alternative and attract new transit ridership;
- Connect major attractions in the Central City with high quality transit;
- Build and operate in mixed traffic and on existing right-of-way at lower cost than other fixed rail options. Fit the scale and traffic patterns of existing neighborhoods; and
- Reduce short inner-city auto trips, parking demand, traffic congestion, and air pollution (Portland Office of Transportation and Portland Streetcar, INC, 2008).

Portland Streetcar is owned by the City of Portland in partnership with TriMet, a regional transit operator. The City's Office of Transportation constructs, operates, and manages the system through contracts with Portland Streetcar Inc., a private nonprofit organization. The system currently has two streetcar lines: the North-South (NC) line and the Central Loop (CL) line. The NC line runs along a 4-mile route in one direction, carrying passengers to major destinations including Legacy Good Samaritan Hospital, the Pearl District, SW Market Streets, Portland State University Urban Center, RiverPlace, and the South Waterfront District. The CL line is a 4.65-mile one-way route that runs from SW Market to the Pearl District and Rose Quarter to Lloyd District, Convention Center, Central Eastside, and OMSI (see Figure 17).

There are a total of 70 stops that are located every one to four blocks. The NS Line runes every 14 minutes and the CL Line runs every 17 minutes during the weekday peak hours from 9:30 A.M. and 6:30 P.M. During off-peak hours before 10:00 A.M. and after 7:30 P.M., streetcars run every 15-21 minutes on the NS Line every 15-21 minutes and every 20-22 minutes on the CL Line. On Saturdays, streetcars run approximately 17-20 minutes from 7:30 A.M. to 11:30 P.M. and on Sundays, both lines service every 20 minutes from 7:30 A.M. to 10:30 P.M.

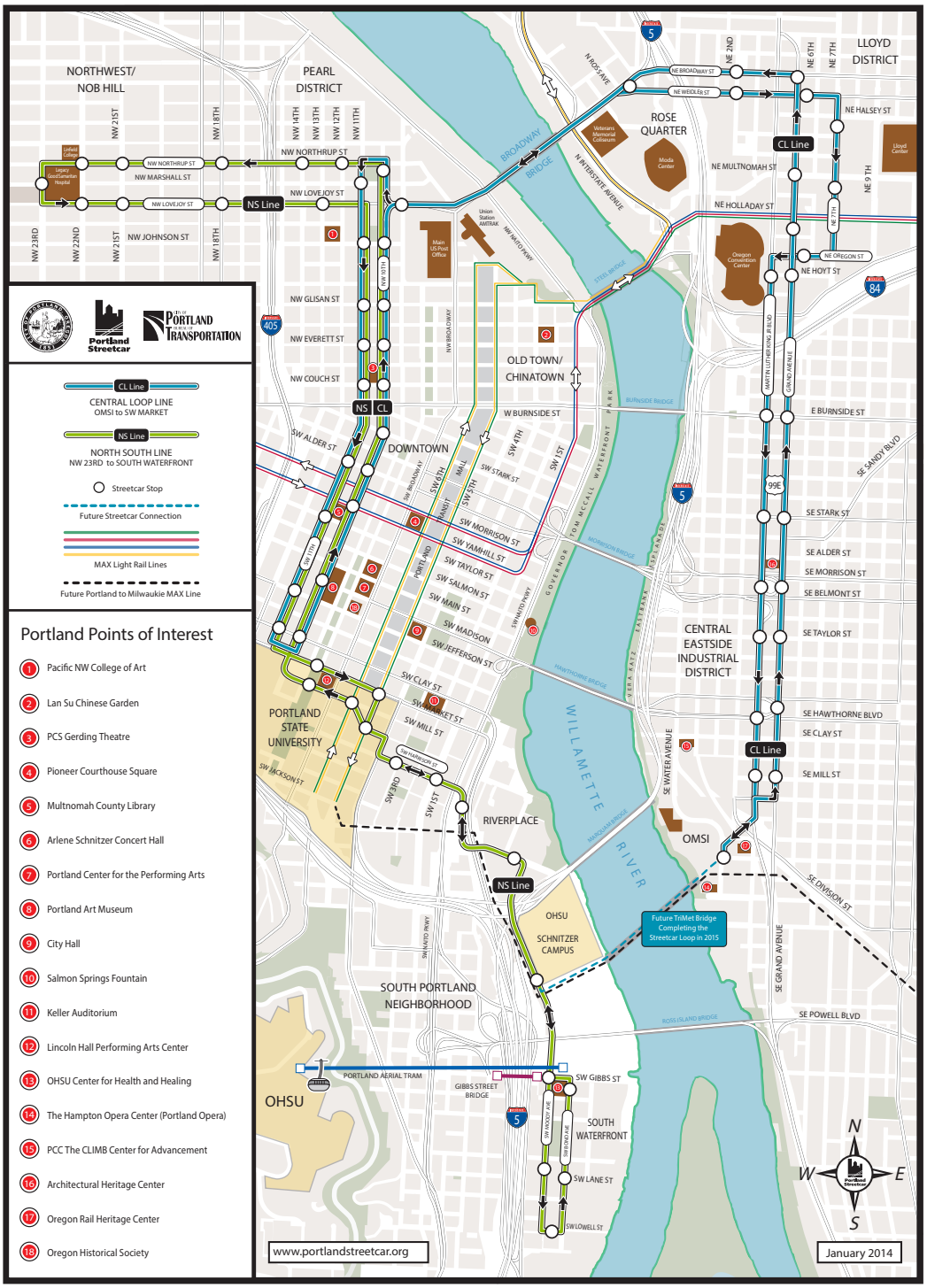

Figure 17. Portland Streetcar routes and stations map. (Source: Portland Streetcar, 2014).

Transit-Oriented Development Policy Framework and Initiatives

Portland has major policy framework and implementation tools that focus on transit-oriented development. The City's effort to launch TOD initiatives and implement policies have revitalized its downtown and created TOD areas that interact effectively with the Portland Streetcars. The tools Portland utilized brought significant result in increasing densities along streetcar lines and station areas, attracting various uses that complement each other, limiting automobile-oriented uses, and creating a livable environment for residents and visitors.

Portland paid greatest attention to the Portland Streetcar station area planning for TOD, which involves designing and shaping the area surrounding a transit station. The City used interim zoning overlays and design guidelines to control minimum densities, parking maximums, and design requirements for areas within walking distance of the stations. The zoning and design guidelines also enhanced the pedestrian environment and improved access to station entrances. These tools included provisions for setback restrictions, street configuration, sidewalk widths, building orientation, minimum and maximum densities, and other pedestrian- and transit-oriented design elements.

Maximum parking requirements also played a significant role in promoting the streetcar system and increase transit ridership. Portland restricted the number of parking spaces allowed for new developments in the downtown area, which increased the viability of transit-oriented development. In addition, the City arranged shared parking programs at several stations, which encourages drivers to share parking areas with each user group occupying the parking lot at different times of the day and week. Park & Ride lots were also utilized in order to enable the use of lower parking space ratios in multi-family buildings.

Portland also emphasized place-making as one of the TOD initiatives. Place-making involves creating attractive, memorable, and human-scale environment that promotes high quality of life and open spaces. Specifically, the Pearl District in Portland provides a mixture of land uses that create a vibrant and interesting place with a variety of uses including restaurants, entertainment venues, art galleries, public plazas, and civic spaces (TRB, 2004).

SOUTH LAKE UNION STREETCAR & TOD IN SEATTLE, WA

Background

Following the Portland Streetcar, Seattle initiated a study to propose a new streetcar route in South Lake Union and potential extensions of the Waterfront Streetcar (see Figure 18). The primary purpose of the South Lake Union (SLU) Streetcar was to increase accessibility to transit, as there was little to no bus service within the neighborhood. In addition, the SLU Streetcar was built as a redevelopment and economic development tool in a largely commercial and industrial neighborhood that had been targeted by the City for redevelopment. Another objective of the City was to set an example of the "New Localism" – the recycling of an older neighborhood that provides residents with access to locally grown and produced foods, small locally owned businesses, green buildings and a reduced carbon footprint, and many amenities (Reconnecting America, 2011).

Figure 18. Seattle South Lake Union Streetcar. (Source: Dazzling Places, 2012).

Streetcar System

The South Lake Union Streetcar opened in 2007 to connect the South Lake Union neighborhood to downtown via Westlake and Terry Avenues. Seattle Streetcar is owned

by the City of Seattle and is operated by King County Metro under a contract with the City. The system runs on a 2.6-mile route in a combination of single- and double-track segments serving the South Lake Union neighborhood. The route connects the City's new Lake Union Park located at the northern end and the Westlake Transit Hub located in downtown (Seattle Streetcar, n.d.). The streetcar serves 11 stops along the route with frequent service at approximately 10 to 15 minute intervals from Monday through Thursday between 6:00 A.M. to 9:00 P.M.; Friday and Saturday between 6:00 A.M. to 11:00 P.M.; and Sundays from 10:00 A.M. to 7:00 P.M. (see Figure 19).

Transit-Oriented Development

Seattle, similar to Portland, has utilized overlay zoning to existing or planned station areas in order to promote complementary mixed-use development. An overlay district is an effective tool to support transit when there is a high demand of land uses around a station (TRB, 2004). Seattle's interim zoning overlay restricts automobile-oriented uses and reduces parking standards within a ¼-mile of potential light-rail stations. This helps in preserving and acquiring future transit-oriented development (TOD) opportunity areas. The following list outlines the City's overlay zoning districts and TOD characteristics:

- A radius that extends up to 1,320 feet (¼-mile) of a station or stop;
- A medium- to high-density residential development;
- Presence of a commercial of mixed-use area where goods and services are available to the public, with opportunities for enhancing the pedestrian environment;
- Opportunity sites for new developments with good access to transit, bicycle, and pedestrian modes; and
- Single-family development only if minimum density standards are met. (TRB, 2004)

The South Lake Union has been designated as one of six urban centers in Seattle with the potential for majority of future residential and employment growth. The City increased height limits and density requirements to accommodate the projected growth in the district (see Figure 20). In addition, all parking requirements were eliminated and allowed the market to determine the number of parking provided with the developments.

Figure 19. Seattle South Lake Uniton Streetcar route map. (Source: Seattle Streetcar, n.d.).

Figure 20. High-density development along the Seattle Streetcar route. (Source: Basepin, 2013).

The City also emphasizes the importance of road and streetscape improvements in a successful TOD. A variety of improvements, including pedestrian amenities and enhanced signage, were made during the streetcar development process. Developers along the potential TOD routes have privately funded streetscape improvements as a part of their development projects. The City also partnered with the developers to enhance green sidewalks in the district. Seattle also made improvements to bicycle amenities to increase access to bicycles and transit.

EXISTING CONDITIONS 4

From September 2013 to March 2014, students in the fourth year Community Planning Studio in the City and Regional Planning Department at California Polytechnic State University, San Luis Obispo prepared the Broadway Corridor Study. Students prepared alternative land use and circulation concepts for the Broadway Corridor in order to facilitate community discussions about future development options along Broadway Street between Maple Street and Second Avenue. As a part of the Broadway Corridor Study process, students conducted extensive research and in-depth analysis on the City and project area's existing conditions. This section summarizes the research and analysis results from the Community Planning Studio to provide background information for the Broadway Corridor Transit-Oriented Development Guideline.

CITYWIDE

Location Context

Redwood City is situated at the geographic center of the San Francisco Peninsula in Northern California, approximately 27 miles south of San Francisco and 24 miles north of San Jose. Its midway location between two major cities offers numerous advantages including convenient access and close proximity to technology services in the Silicon Valley (see Figure 21). The City has a total area of 34.6 square miles and about 44 percent of its jurisdiction is comprised of water bodies.

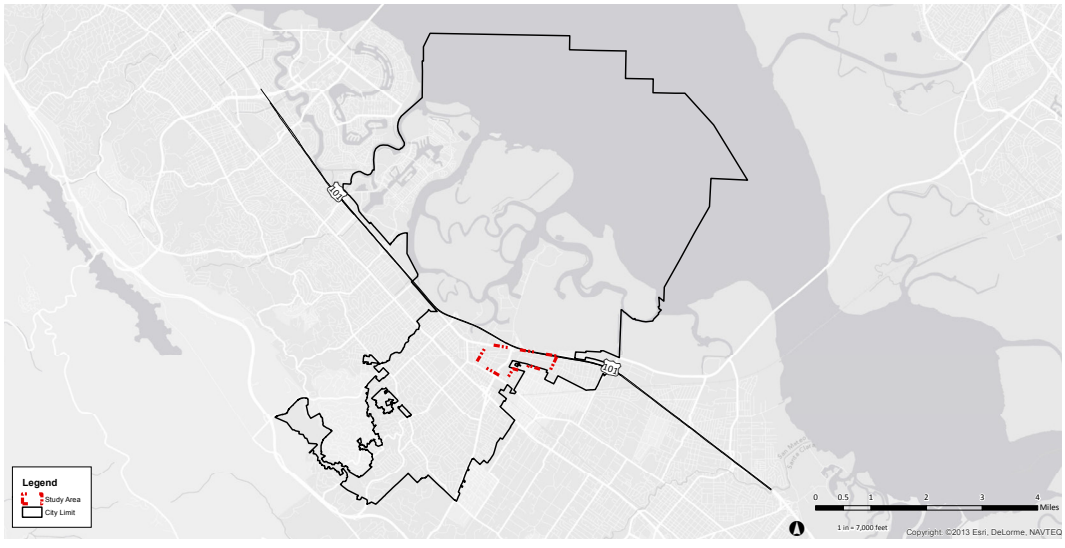

Figure 21. Redwood City location context map. (Source: Broadway Corridor Study, 2014)

Historical Context

Redwood City has an extensive and diverse history as one of the oldest cities in the San Francisco Peninsula. The City was originally a lumber port town during the Gold Rush and became the county seat of San Mateo County in 1856. Development continued to grow through the 1920's, and commercial activity began to shift westward from San Mateo to El Camino and Broadway. Technology companies also began to settle in Redwood City including Ampex, the developer of audio and videotape, in the 1950's and Oracle, a computer software company, in the 1980's. Since then, Downtown transformed into a vital center for commerce, government, and manufacturing. During the early 2000's, Downtown started to become revitalized, which expanded into other areas of the City.

Population

Understanding population, housing, and employment characteristics of a city is critical in determining future development opportunities and guiding a transit-oriented development. According to data from 2007, Redwood City had the fifth largest population with 77,269 in San Mateo County, which could be attributed to the City being the San Mateo County seat (U.S. Census Bureau, 2010). Since 2000, the City experienced a population increase of two percent, which is one of the lowest percent change compared to other cities within San Mateo County (U.S. Census Bureau, 2010) (see Table 1).

In 2010, the City's population was 76,815 with 29,167 housing units. In comparison, San Mateo County had a population of 739,311 with 271,031 housing units (U.S. Census Bureau, 2010). Gender distribution in 2010 was balanced with male population of 49.8 percent and female population of 50.2 percent.

Table 2 portrays the age groups that exist within Redwood City. The age group of 45 to 64 years had the highest increase in percent change from 1990 to 2000. This indicates that the number of baby-boomers has significantly grown in the City, and additional senior housing will be in high demand to accommodate them. Young adult age group from 25 to 44 years was the largest population in 2000 at 37 percent of the total population. This data illustrates that young adults are choosing to live and work in the City, and there are adequate employment and housing opportunities within the City.

Table 1: Population in cities within San Mateo County Jurisdiction (U.S. Census Bureau, 2010).

Jurisdiction	2000	2007	Percent Change
Redwood City	75,447	77,269	2%
Belmont	25,138	26,078	4%
Daly City	103,621	106,160	2%
East Palo Alto	29,450	32,817	12%
Foster City	28,803	30,308	5%
Hayward	140,030	147,845	6%
Menlo Park	30,786	31,490	2%
Mountain View	70,708	73,262	4%
San Carlos	27,697	28,857	4%
San Mateo	92,482	95,776	4%
South San Francisco	60,552	62,614	3%
Sunnyvale	117,229	135,721	3%
San Mateo County	649,623	739,469	5%

Table 2: Redwood City Age Characteristics (U.S. Census Bureau, 2010).

Redwood City Age Characteristics					
Age Group	1990		2000		Percent Change
	Number	Percent of Total	Number	Percent of Total	
Preschool (0-4 years)	5,249	8%	5,679	8%	8%
School Age (5-17 years)	9,204	14%	11,812	16%	28%
College Age (18-24 years)	6,547	10%	6,302	8%	-4%
Young Adult (25-44 years)	26,199	40%	28,185	37%	8%
Middle Age (45-64 years)	11,355	17%	15,733	21%	39%
Senior Adults (65+ years)	7,518	11%	7,691	10%	2%
Total	**66072**	**100%**	**75,402**	**100%**	**14%**

Transportation

Circulation is a major component in planning the future development of the Broadway Corridor Study Area. Redwood City anticipates future development in the City to support multi-modal transportation options (Redwood City, 2010). However, the existing conditions for various transportation modes vary throughout the City. This section illustrates the City's pedestrian, bicycle, transit, highway, and parking conditions.

Pedestrian Conditions

The pedestrian conditions in Redwood City consist of mainly sidewalks and crosswalks that are provided along many of the major streets in the City. The conditions of the existing sidewalks and crosswalks vary, and some streets are more attractive to walk through than others, thus leading to different levels of "walkability" throughout the City (Redwood City, 2010).

Most of the major streets located in Redwood City have sidewalks on both sides of the street and vary in width. The Downtown area has a safe and pedestrian-friendly environment with well-maintained sidewalks (see Figure 22). In addition, Downtown generates the most pedestrian activity in the city. The General Plan indicates that the City is striving to make all sidewalks a minimum of 12 feet wide to increase pedestrian safety (Redwood City, 2010).

Figure 22. Well-maintained sidewalk in Downtown Redwood City. (Source: CRP 410&411).

Many of the major streets in the City, especially in Downtown, provide signalized crosswalks (see Figure 23). However, minor streets are either unsignalized or has a crosswalk without signals. Because there are a limited number of safe crosswalks within a ¼-mile walking distance, pedestrians often cross mid-block (Redwood City, 2010). The lack of signalized crosswalks has a major impact on the walkability and safety along the street.

Figure 23. Signalized crosswalks in Downtown Redwood City. (Source: CRP 410&411).

Bicycle Conditions

Bike paths exist only on a few streets within the City. Class I facilities exist as the Redwood Shores Trail and the Bay Trail along US 101 between the Whipple Avenue and Holly Street interchanges. Class II facilities include the bike lanes on Alameda de La Pulgas between Woodside Road and Jefferson Avenue, and Industrial Way between Whipple Avenue and the San Carlos city limit. Class III facilities are the most common throughout the City, some of which can be found on portions of Broadway and Roosevelt Avenue. Although arterials such as El Camino Real and Woodside Road often provide the most direct routes, few cyclists use them because they are predominantly auto-oriented and are not bicycle

friendly. As a result, most bicyclists tend to take more roundabout routes on side streets to reach their destination (Redwood City, 2010, pg. 106).

The City launched the Bay Area Bike Share program on August 28. 2013 (see Figure 24). This program provides bicycles for short-term public use. Users can check out bicycles from specific stations for up to 30 minutes and return them to any station when finished. The City has a total of six Bike Share stations, which are all located within the Downtown area.

Figure 24. Bay Area Bike Share Program in Downtown Redwood City. (Source: CRP 410&411).

Public Transit Conditions

Public transit takes many forms, including heavy rail, light rail, bus, shuttle, para-transit, streetcar, and ferry. Redwood City has three major public transit systems: Caltrain,

SamTrans, and shuttles. The Redwood City Caltrain Sequoia Station is located at the heart of Downtown between Jefferson Avenue and Broadway (see Figure 25). The train runs from 5 A.M. to 11 P.M. on weekdays and 8 A.M. to 12 A.M. on weekends. The train departs every half hour to ensure connections to public transit within the City. Within the Redwood City, the rail line runs parallel to and northeast of El Camino Real. On a typical weekday, up to 8- trains serve the Redwood City Sequoia Station, placing the station at the sixth busiest Caltrain stop overall.

Figure 25. Caltrain in Downtown Redwood City. (Source: CRP 410&411).

SamTrans is the dominant public transit service that runs through Redwood City. The fixed-route bus service runs along a variety of routes. Community routes serve local community destinations such as schools, express routes operate during peak commute times only, and Caltrain connection routes provide service solely to the Sequoia Station (Redwood City, 2010). While SamTrans offers eight routes throughout the city, Route 270 is the only one that runs through the Broadway Corridor Study Area (SamTrans, 2013).

SamTrans, in partnership with Caltrain, offers three shuttle services to various business districts within the City. The shuttles are free to public and depart every half hour during the operation hour from 7 A.M. to 8 P.M. The Pacific Shores Shuttle connects to Seaport Boulevard, the Redwood City Mid-Point Shuttle links Caltrain to the Mid-Point technology business park, and the Seaport Centre Shuttle connects to the Seaport Centre Office Building Park. The Mid Point Shuttle is the only shuttle offered that runs through the project area. There are 9 stops within the Broadway Corridor Study Area.

Highway Conditions

Caltrans is the state agency responsible for managing California's highways and freeways. Redwood City lies within Caltrans District 4. Caltrans currently maintains four highways within Redwood City – State Routes 82, 84, 101, and 109.

Parking Conditions

A parking plan has been developed for the more congested and popular downtown area of Redwood City. Parking is not yet specifically addressed for the Broadway Corridor Study Area. Redwood City's downtown features demand-based parking and free parking during specific hours and in specific locations (Redwood City, 2010). On-street parking in the downtown is operated by individual meters and pay-by-space meters with Pay-By-Phone capabilities (see Figure 26). The City also has three downtown parking garages and seven lots (see Figure 27). A map of parking locations with their regulations is shown below (Redwood City, 2010). Outside of downtown, there is limited metered or pay-by-space parking. Most parking outside of downtown is free on-street parking or parking lots, supporting specific shopping centers.

Land Use

The most well-known part of Redwood City is the downtown, especially near the recently renovated movie theater and courthouse square between Hamilton St. and Beech St (see Figure 28). Historically, commercial uses and development have been "centered along El Camino Real and Broadway Street," according to the Redwood City Land Use Report (pg. 2). Office space is intermixed with the commercial uses, although the signage and presence of these uses are not noticeable to those enjoying Downtown Redwood City. A strong historic presence is also demonstrated on Broadway Street and in the downtown

Figure 26. Angled on-street parking in Downtown Redwood City. (Source: CRP 410&411).

Figure 27. Parking structure setback from the street in Downtown Redwood City. (Source: CRP 410&411).

due to the centric city hall and monolithic historic museum (see Figure 29). Aside from the booming commercial centers that make up downtown and Broadway Street, “residential uses occupy the vast majority of the City’s non-water land” (Redwood City, 2010).

Figure 28. Renovated theater in Downtown Redwood City. (Source: CRP 410&411).

Figure 29. Redwood City History Museum. (Source: CRP 410&411).

The Table 3 shows the acreage of each kind of land use within the City and their Sphere of Influence, the total acres and percent of total per land use in Redwood City. Due to a vast majority of city land designated as Open Space, Water, and Recreation the portion of developable land greatly less than what one would assume.

Table 3: Land use distribution in Redwood City (Source: CRP 410&411).

Baseline Land Uses - 2008				
Land Use	City (Incorporated) Acres	Sphere of Influence (Unincorporated) Acres	Total Acres	Percent
Residential (single-unit and multi-unit)	2,966	1,282	4,248	17.4%
Commercial	976	29	1,050	4.3%
Industrial	361	122	483	2.0%
Public and Quasi-Public*	433	39	472	1.9%
Open Space, Water, and Recreation	14,634	51	14,685	60.3%
Salt Harvesting	1,466	-	1,466	6.0%
Vacant	65	4	69	0.3%
Other (Streets, Rail lines)	1,487	395	1,882	7.7%
Total	**22,388**	**1,922**	**24,355**	**100%**

Outside of the downtown area, large shopping centers dominate the northern, eastern, and far northern sections of Redwood City. These shopping centers exist along Corridors, and consist of either large mall-type uses or heavy mixed uses. The far-northern and eastern area of the city are especially filled with Corridor designated mixed-use.

Redwood City is also the home to a large amount of medical and light industrial uses. These exist to the north, south, and east of the downtown Broadway area, nestled between high- and medium-density residential uses. The intensity of the light industrial uses in Redwood City is due to the “access to a deep-water port,” which “led to extensive industrial activity along the City’s bayfront” (Redwood City, 2010). The northern portion of the City contains office/technology uses, with medium- and high-density residential units surrounding it.

Park and single-family land uses are most prominent to the west and southwest of Redwood City. Edgewood City Park is the largest inland park in the City, and is surrounded

with low residential uses. Huge tracts of coastal and reserve land exist in the northern half of the city, separating the lagoon area of Redwood City with the lower, Highway 101 tiered section. These public and park spaces contain a variety of recreational and environmental uses range from simple trails to intense wetland rehabilitation areas.

Urban Form

Redwood City defines urban form as "the physical structures that house land uses, as well as infrastructure that influence how we experience an area" (Redwood City, 2010). The City's urban form is shaped in part by its multiplicity of historic architectural styles. Such diversity, coupled with various changes in commerce, housing demand and governance has shaped the city's urban form. Similarly, distinct neighborhoods, corridors and centers, which form the basic components of the city's urbanized form, have also been affected by varying historic patterns. Each individual neighborhood is easily recognizable through its own unique character and architecture. Corridors in Redwood City serve not only as destinations for commercial retail and service uses, but also as important multi-modal travel routes. While currently these corridors are predominantly automobile oriented, Redwood City hopes to create pedestrian friendly environments along its major arteries and recognizes the potential for high-quality transit along certain corridors to improve transportation and create opportunities for new housing developments.

The public realm is defined as the parts of the city, regardless of ownership, that are publicly accessible to the public. These include, but are not limited to, streets, plazas, parks, corridors, and landmarks. These elements enhance the livability and vibrancy of an area. In Redwood City, the public realm is shaped by the urban form and land use decisions of the built environment. Redwood City's public realm focuses on transforming corridors to implement pedestrian friendly street improvements where people can live and work. Downtown, the heart of Redwood City, is where the public realm is most active. This area embodies a well-defined, human scale public environment that encourages active pedestrian environments (see Figure 30). Surrounding areas support the public realm, but do not possess a strong visual character or identity compared to the public realm in Downtown. The City is continuously improving its public realm design guidelines to establish a consistent character and quality that unifies the whole City.

Figure 30. Pedestrian-friendly environment in Downtown Redwood City. (Source: CRP 410&411).

PROJECT AREA

Location Context

The Broadway Corridor project area is located between Downtown and the Stanford in Redwood City development, spanning approximately one mile from Maple Street to Douglas Street along Broadway Street (See Figure 31). (INSERT PROJECT AREA MAP). The corridor has become the center of commerce and industry in the City due to its proximity to the U.S. Highway 101 and State Route 84 interchange on Woodside Road. In addition, the corridor possesses a huge opportunity of development as Broadway Street extends out from Downtown where its historic buildings support pedestrian-scale local commercial businesses that create a lively atmosphere. The Stanford development also provides a great support for the corridor's growth as the development is an economic hub with high number of employees and growing number of start-up businesses.

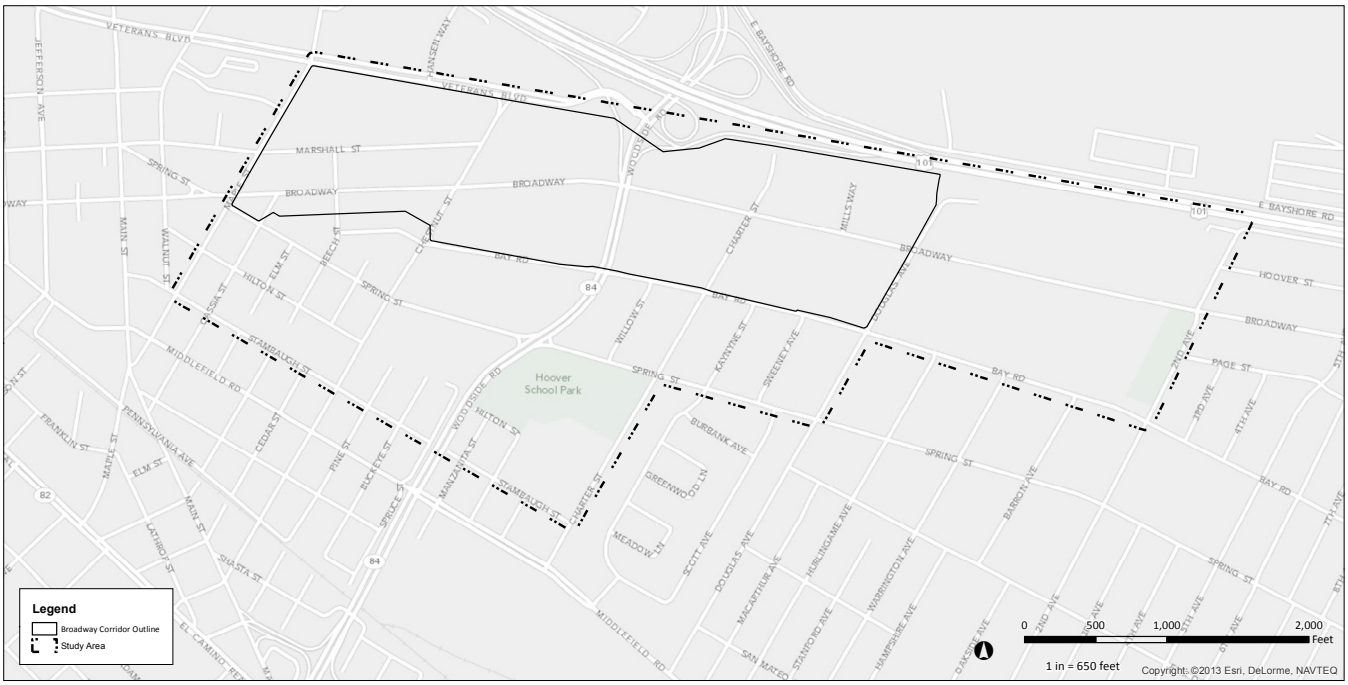

Figure 31. Project area map. (Source: Nuri Cho).

Transportation

The Broadway Corridor study area currently does not adequately support safe and comfortable multi-modal transportation options (see Figure 32). The existing conditions in the area limit full accessibility to the Broadway corridor by all travel modes.

Figure 32. Existing automobile-oriented Broadway Corridor. (Source: CRP 410&411).

Pedestrian Conditions

Throughout the Broadway Corridor study area, sidewalks vary in widths, ranging from four to 12 feet (Redwood City, 2010). The sidewalks on Maple at Broadway, Cassia at Broadway, Beech at Broadway, Chestnut at Broadway, Charter at Broadway, Mills at Broadway, and Douglas at Broadway meet the recommended width outlined in the General Plan for the major streets. While these sidewalks meet the minimum of 12 feet, the conditions are poor and are a contributing factor to the minimal pedestrian activity (Redwood City, 2010) (see Figure 33). Majority of the sidewalks in the study area are cracked and uneven with varying widths (see Figure 34).

Figure 33. Sidewalk with drainage problems in the project area. (Source: CRP 410&411).

Figure 34. Sidewalk with cracks in the project area. (Source: CRP 410&411).

Within the Broadway Corridor Study Area, the signalized crosswalks that exist are insufficient in terms of the time given for pedestrians to cross the street. The length of time given is not long enough to allow pedestrians to safely cross. The only signalized crosswalks within the project site are located at Chestnut and Broadway and Woodside and Broadway. Broadway Street between Chestnut and Woodside is a long distance, and there are no mid-block crosswalks provided (Redwood City, 2010). Pedestrians often must cross four lanes of traffic in the midst of fast-travelling automobiles (see Figure 35)

Figure 35. Dangerous unsignalized crosswalk in the project area. (Source: CRP 410&411).

The US 101/SR 84 interchange at Woodside Road is a major intersection within the Broadway Corridor Study Area. The off ramps of this interchange connect to Broadway, creating a 5-way intersection. The high vehicular activity in this area greatly reduces the pedestrian activity. Because this portion of the study area is auto-oriented, limited pedestrian infrastructure and amenities are provided at this intersection.

Bicycle Conditions

The only existing bicycle facilities in the project area are in the Stanford in Redwood City development area. Other than the Class II lanes in the Stanford area, the bicycle facilities are inconsistent throughout the Broadway Corridor.

Public Transit Conditions

Besides the three existing public transit system, Redwood City envisions a streetcar system for Broadway Street in the General Plan. The circulation goal of the General Plan is to implement and maintain safe and comfortable multi-modal transportation. To meet its goal, the City proposes a streetcar feasibility study for Broadway Street as well as realigning the U.S. Highway 101 and S.R. 84 interchange at Woodside Road (Redwood City, 2010). The General Plan denotes the future Broadway Street as a “Transit Street” typology, proposing a potential streetcar network (Redwood City, 2010).

Highway Conditions

The 84 and 101 interchange at Woodside lies within the project site and serves as one of the main access points into the City (Caltrans, 2013) (see Figure 36). Caltrans plans to realign the 84 and 101 interchange. They hope to improve maintenance of pavement surfaces, include median and street landscaping, implement traffic lights to accommodate bicyclists, and prioritize bus mobility. Caltrans has been considering removing one of the five entry points into Woodside Road (Caltrans, 2013).

Figure 36. U.S. Highway 101 and S.R. 84 interchange. (Source: Google Map, 2014)

Parking Conditions

The Broadway Corridor Study Area has mostly free, on-street parking in residential districts, although some metered, on-street parking exists on Broadway Street, between Maple and Beech, as observed during the studio students' site visit (see Figure 37).

Figure 37. Metered on-street parking in the project area. (Source: CRP 410&411).

Land Use

Synoptic and General Land Use Survey Methodology

During the CRP 410 studio, the class gathered relevant data and information from various sources, both primary and secondary, in order to research and analyze existing land use characteristics of the Broadway Corridor Study Area. The primary sources include synoptic surveys, general land use surveys, and observations made from two site visits. The synoptic survey was chosen as one of the primary sources, because it allows the team to collect accurate information on current conditions of the existing built environment through detailed observations of each parcel along the Broadway Corridor. The general land use surveys provide an overall understanding of parcels in adjacent neighborhoods of the study area based on on-site observations. Observations made from these two sets of surveys create the basis for analysis of existing land uses on in the Study Area.

Surveyed Land Uses in the Synoptic Survey Area

Table 4 illustrates the surveyed land uses dispersed throughout Broadway Corridor study area (see Figure 38). Light Industrial is the dominant use with 27.6 percent and a total acreage of 13.1 and 25 parcels. The majority of Light Industrial uses are located on the east area of Woodside Road along Broadway Street. The Public/Quasi-Public use is the next prominent use with 26.3 percent. Even though there are only three parcels that are designated as Public/Quasi-Public, the total acreage of 12.5 exceeds other uses. This is due to the large parcels with the Corporate Yard and the Post Office located on the northern corners of Broadway Street and Woodside Road. Next dominant use is the Commercial/Retail-General Retail with a total percentage of 24.8 and the total acreage of 11.8. The parcels located on the southwest corner of Broadway Street and Woodside Road comprises the largest percent of the Commercial/Retail-General Retail use with CVS, Denny's, and other uses. Although there are no completely vacant parcels, there are eight parcels along Broadway Street with improvements or vacant buildings (see Figure 39).

Table 4: Broadway Corridor Land Use Distribution (Source: CRP 410&411).

Baseline Land Uses - 2008				
Land Use	City (Incorporated) Acres	Sphere of Influence (Unincorporated) Acres	Total Acres	Percent
Residential (single-unit and multi-unit)	2,966	1,282	4,248	17.4%
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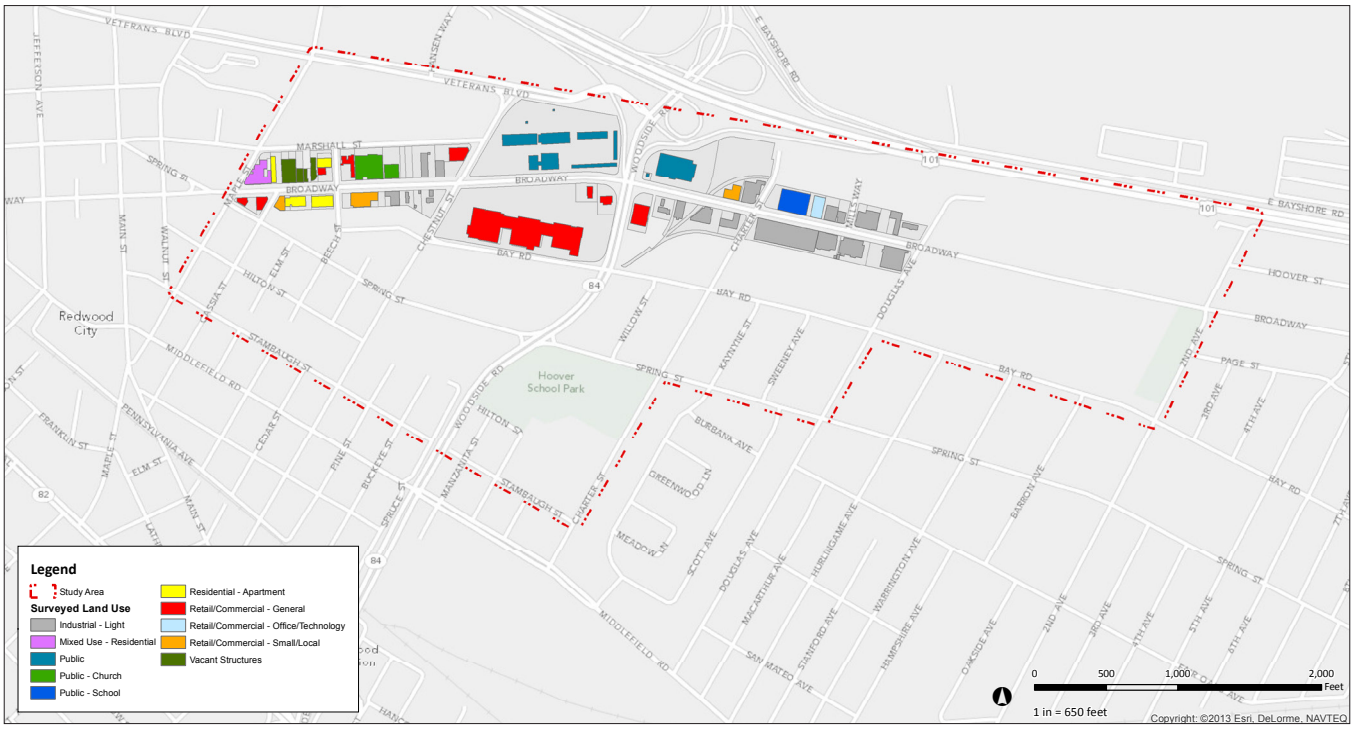


Figure 38. Surveyed land uses along the Broadway Corridor. (Source: CRP 410&411).

Figure 39. Vacant parcels with improvements along the Broadway Corridor. (Source: CRP 410&411).

Building and Parcel Conditions in the Synoptic Survey Area

The synoptic survey also included an assessment of building and parcel conditions in the study area. Chart 1 illustrates the proportion of each parcel condition category compared to all surveyed parcels. Majority of the parcels are in good or fair condition with about 47 percent of the parcels in good condition and about 45 percent in fair condition. In total, there are about five parcels, or eight percent, that are considered to be in poor condition.

Chart 2 illustrates the proportion of each building condition category in comparison to the total number of buildings surveyed. Majority of the buildings, or 56 percent of the total surveyed buildings, are in good condition. About 37 percent of the buildings are in fair condition, and only four buildings, or seven percent, are considered to be in poor condition.

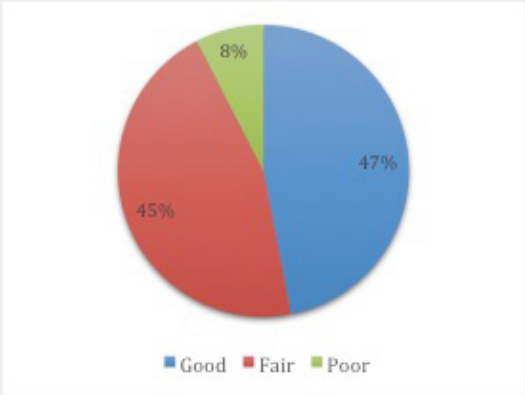


Chart 1. Parcel conditions in the Broadway Corridor project area. (Source: CRP 410&411).

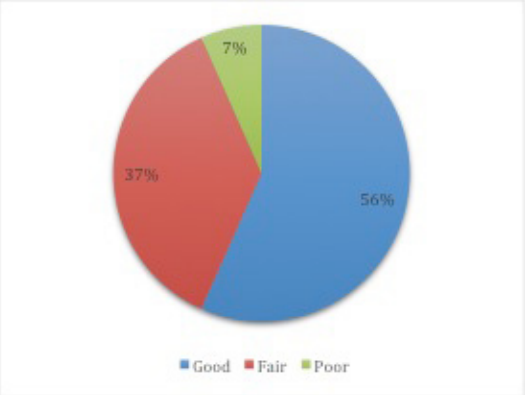


Chart 2. Building conditions in the Broadway Corridor project area. (Source: CRP 410&411).

Land Uses in the General Land Use Survey Area

A large proportion of the parcels surrounding the Broadway Corridor are Office/ Technology. Office/Technology accounts for a large portion of the surveyed area. That is most likely because of the Stanford in Redwood City area and other technology campuses in Redwood City. The second most common land use is Light Industrial. A portion of the surrounding area is included in the industrial zone of Redwood City. One use that is not fully represented from the General Land Use Surveys is Residential of both single family and apartments. The neighborhood that has the high number of residential units is just

south of the Broadway Corridor Study Area. The distribution of acreage in the surveyed area will be illustrated in a table created at a future time.

Urban Form

The corridor is located immediately east of the downtown, but despite its close proximity to the city center, the urban form of the corridor differs greatly from that of the downtown. Within the Downtown Core, Broadway is the center of commerce and the heart of the downtown. However east of the Downtown, the street is less appealing for pedestrians and has wide roads, limited streetscapes and buildings oriented for automobile transportation.

This eastern portion of Broadway lies within the Broadway/North Fair Oaks Employment Center and as such, consists primarily of office and light-industrial uses (Redwood City, 2010). The employment center on Broadway provides much space for different businesses and enterprises, and provides strong opportunities for research, development and technology.

As a bridge between two vital districts within Redwood City (the Downtown and the Broadway/North Fair Oaks Employment Center), it is important that the Broadway Corridor improves pedestrian, bike, and transit mobility. Currently the area greatly favors automobile users and does not provide incentives to walk or bike. As such it is important to improve upon existing sidewalks, create better-marked bike lanes, and implement more streetscape along the street.

From Maple St. and 2nd Ave, Broadway loses its character and identity. The public realm becomes less distinguishable and fewer activities take place. Figure 40 depicts the unattractive, closed frontages of buildings and their bare concrete facades. Buildings do not consider their interaction to the street, which creates an uninviting atmosphere. Streets become wider and favor the vehicle rather than the pedestrian. This discourages walkability, which contrasts from the active street frontages present in Downtown. As shown in Figure 41, this part of Broadway includes minimal landscaping and lacks attractive public spaces. The area possesses a bottleneck/industrial feel and there is no coherent identity unifying the surrounding areas.

Figure 40. Unattractive building facade in the project area. (Source: CRP 410&411).

Figure 41. Minimal landscaping and lack of attractive public spaces in the project area. (Source: CRP 410&411).

COMPLETE STREETS PROPOSAL 5

For the Broadway Corridor Study prepared over a period of six months, students in the Community Planning Studio proposed two public transit alternatives, a streetcar system and a Bus Rapid Transit system, to create a complete street for Broadway Street. As Redwood City envisions a streetcar system for the City, the Broadway Corridor TOD Guideline focuses on providing guidance to accommodate and implement a streetcar system. This chapter highlights main features of the complete streets with a streetcar system from the Broadway Corridor Study.

VISION AND GOALS

Broadway Street will be a complete street that provides access and appropriate infrastructure to all modes of transportation. The corridor will incorporate infrastructure and mobility enhancements that will facilitate movement across Woodside Road and promote walking, bicycling, and transit use through a streetcar system. The transit routes and stops, as well as circulation patterns will complement adjacent land uses along Broadway Street. The corridor will incorporate complete street principles and include the following features:

1. Traffic demand management strategies will be included to minimize congestion and ensure efficient movement of vehicles in, out, and throughout the project area.
2. Intelligent Transportation Systems will be included to optimize efficiency and safety, vehicle arrival times, and wayfinding/navigation.
3. Streetcars will be given signal priority at intersections to minimize idling time.

BICYCLES

Redwood City recognizes the importance of bicycle infrastructure enhancement to encourage healthier lifestyles and environment (Redwood City, 2010). In order to implement the City's vision of continuous bikeways, 5-foot wide Class II bicycle lanes will be placed throughout the Broadway Corridor, continuous from Maple Street to Second Avenue. The lanes will have green-colored pavement and symbol markings to enhance visibility and separation from vehicular lanes (see Figure 42). These lanes will serve all bicycle enthusiasts including recreational riders as well as commuters.

Figure 42. Class II bicycle lane with green pavement. (Source: The Source, 2013).

Various bicycle amenities are proposed to encourage the use of bicycles and improve convenience and mobility for cyclists. Bike boxes will be placed at intersections that are anticipated to have high turning volumes of both vehicles and bicycles (see Figure 43). Potential intersections to have bike boxes include Maple Street, Chestnut Street, and Woodside Road. The City's existing Bay Are Bike Share program will be expanded to place in the project area to increase accessibility to the program for community members.

Figure 43. Green bike box. (Source: Streetblog SF, 2011).

PEDESTRIANS

The Broadway Corridor will be a pedestrian-friendly street with improved sidewalk network and enhanced amenities and streetscape features. In order to meet the City's vision of a continuous sidewalk network with ample room for pedestrian activity, the corridor's existing sidewalks will be upgraded to have widths ranging from 10 to 12 feet. The proposed width will be consistent and continuous throughout the Broadway Street, which improves mobility and accessibility for pedestrians. Sidewalks will have at least five feet of clear and uninterrupted space between transit shelters and building facades. The conditions of sidewalks will also be enhanced to promote a safer and comfortable environment for pedestrians.

A variety of pedestrian amenities and features will be provided to ensure safety and comfort and create a vibrant environment along the corridor. Marked crosswalks will be provided at all intersections controlled by traffic signals with the following conditions: high vehicular traffic volumes and speeds, poor stopping sight distances, high pedestrian volumes, school zones, and/or substantial numbers of elderly or disabled pedestrians. Crosswalks at controlled intersections will be striped using the continental pattern for high-visibility of the crosswalk to oncoming traffic (see Figure 44). In addition, pedestrian countdown signals will be installed at every controlled intersection to allow sufficient time to be allocated per cycle for pedestrian crossings.

Figure 44. Continental crosswalk. (Source: Nacto, n.d.).

AUTOMOBILES

Broadway Corridor will be reconfigured to have four auto lanes, two of which will be auto-only lanes, one for each direction, and two lanes will be streetcar lanes shared with autos. The shared streetcar-auto lanes will be located toward the center of the right-of-way. The width of all auto lanes along Broadway Corridor are proposed to be 10-feet wide in order to calm traffic speeds in the project area (see Figure 45 and Figure 46).

STREETCAR

The streetcar will provide a new mode of transportation to the Broadway Corridor in Redwod City. The proposed streetcar system will connect the Sequoia Caltrain Station to the future Stanford in Redwood City development via Broadway Street. The City will have an opportunity to expand the streetcar service to new areas as the demand for more transportation options increase in the future.

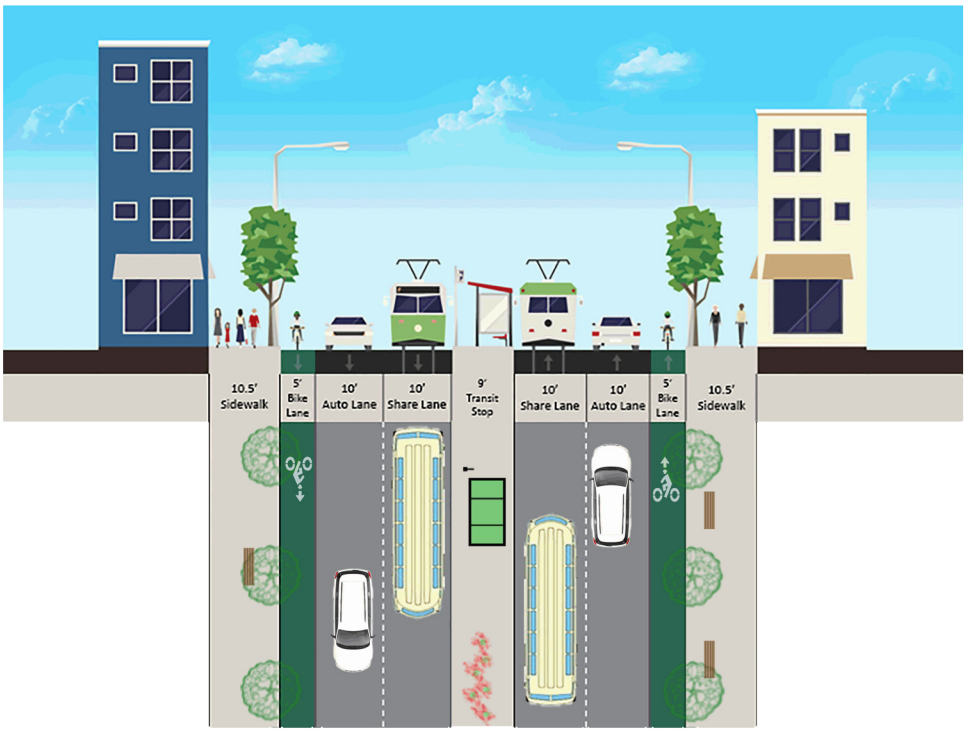
The streetcar lanes will be shared with autos. They will be center-running lanes with highly-visible platforms and clearly marked crosswalks for pedestrian on-boarding and off-boarding. The platforms will have transit shelters with seating and shade, sufficient signage, lighting for safety, and real-time rider information.

The streetcar system will form about a 3-mile loop between Redwood City's Caltrain station, Sequoia Station and incoming Stanford in Redwood City, between Douglas and Second Avenue and U.S. 101 and Bay Road (see Figure 47). The loop starts at Caltrain, wraps around Downtown, proceeds down Broadway Street towards Stanford in Redwood City, wraps around the Stanford area and proceeds back down Broadway Street to the north of Downtown on Marshall Road and turns south at Winslow Street to the proposed streetcar stop at Sequoia Station.

At an estimated speed of 15 miles per hour, it would take approximately 45 minutes for a streetcar to service the entire route. Three streetcars would be needed to achieve a 15 minute frequency. The start and end time of the route should be scheduled to meet Caltrain trains arriving during the AM peak period and trains departing during the PM peak period.

Figure 45. Broadway Street configuration with a streetcar without a bus shelter. (Source: CRP 410&411).

Figure 46. Broadway Street reconfiguration with a bus shelter. (Source: CRP 410&411).



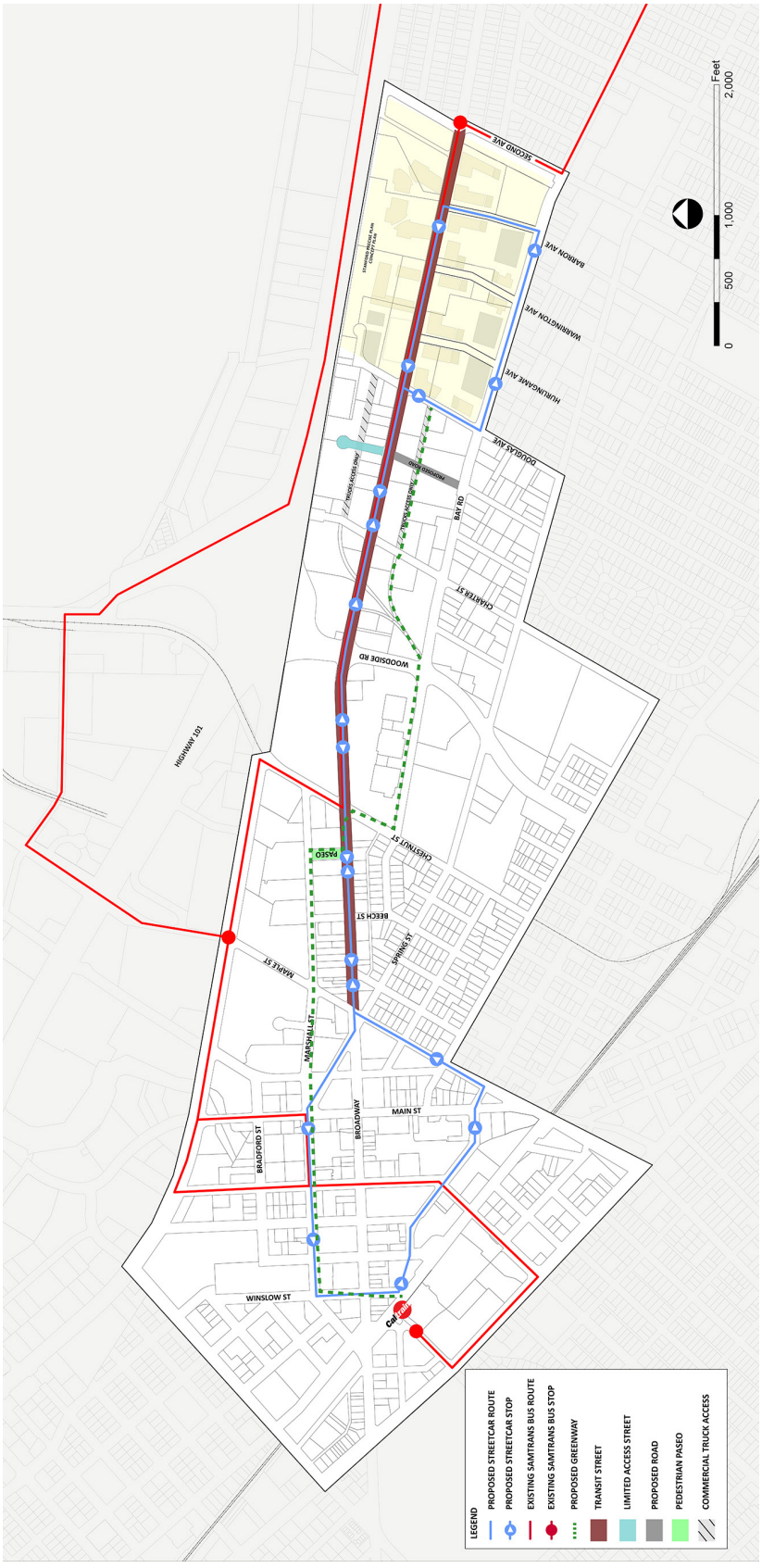


Figure 47. Overall circulation proposal with a streetcar route. (Source: CRP 410&411).

6 STATION AREA OVERLAY PROPSAL

PURPOSE

Transit stations come in many forms in a wide range of contexts. Some stations are located in active and vibrant downtowns at the core of local economy while others are located in employment districts or residential neighborhoods where transit is used as means for commuting. Also, some stations are placed in areas that are undergoing rapid growth, and other stations are placed in locations where it is already built-out and more established with little to no changes. Wherever stations are located, they will all face unique challenges according to the locational context, users, and purpose and will require specifically tailored strategies based on the specific area and population the stations serve. The TOD Station Area Overlay section is designed to guide the public, planners, and decision-makers in developing an effective zoning and land use systems for the Broadway Corridor in Redwood City. This section builds on the City's planning documents including the General Plan, Downtown Specific Plan, and Stanford in Redwood City Specific Plan to define appropriate mixture of land uses, allowed and prohibited uses along the corridor, density, and intensity. In addition, the section proposes three overlay districts in the Broadway Corridor project area and provides guidelines for development characteristics for each district.

CORRIDOR TYPOLOGY

Before developing guidelines for streets and transportation modes, the Broadway Corridor TOD Guideline will establish the corridor typology for the corridor based on Redwood City's General Plan and the Reconnecting America and the Center for Transit-Oriented Development's standards for typologies established in the Station Area Planning. The General Plan designates Broadway Street as a Transit Street which is intended for a future streetcar system (Redwood City, 2010). The Broadway Corridor will accommodate moderate to high volumes of through-traffic, and transit is given priority if any conflicts arise between transit and other travel modes (see Figure 48).

The General Plan also designate land uses along Broadway between Downtown and Woodside Road as Mixed Use – Corridor and Mixed Use – Neighborhood as illustrated in Figure 49. These land uses are meant to help the Broadway Corridor transition from an auto-oriented commercial strip to a complete neighborhood that complements Downtown

located to the east of the corridor. Broadway southeast of Woodside Road is designated as the Commercial – Office Professional/Technology with the Light Industrial Incubator Overlay. These designations are intended to define the corridor as a connection between Downtown and Stanford in Redwood City project, the two important employment districts. The General Plan envisions Broadway with enhanced mobility to allow better movement between the business districts for all travel modes (Redwood City, 2010).

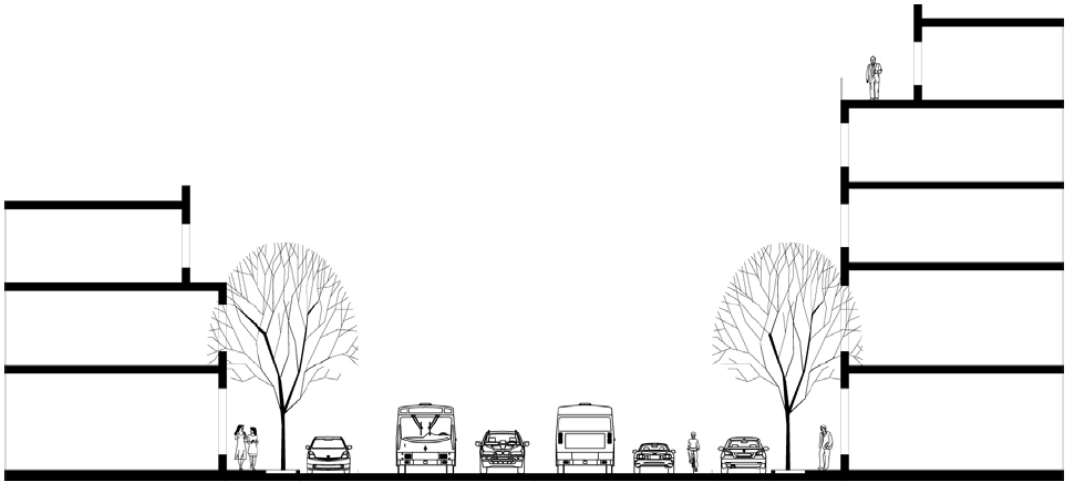


Figure 48. Illustrative example of Transit Street typology established in the General Plan. (Source: Redwood City, 2010).

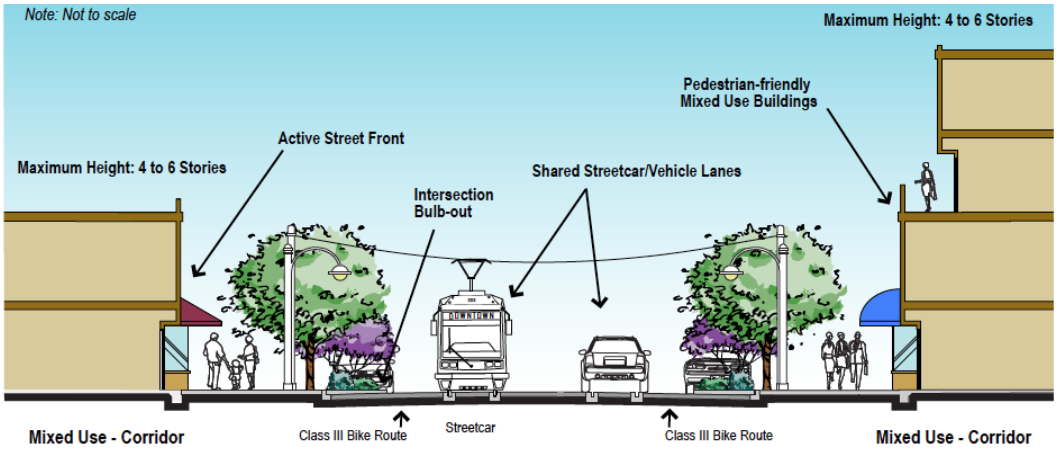


Figure 49. Illustrative street section showing land use designations and envisioned mobility. (Source: Redwood City, 2010).

In alignment with the City's General Plan, the TOD Guideline identifies place type based on the Reconnecting America and the Center for Transit-Oriented Development (CTOD)'s Station Area Planning guidebook. The Broadway Corridor and the study area have the characteristics of both the Mixed-Use Corridor and the Special Use/Employment District (see Figure 50). The Mixed-Use Corridor typology represents the General Plan's designation of Mixed Use – Corridor and Mixed Use – Neighborhood. The Mixed-Use Corridor focuses on economic and community activity without a distinct center. Land uses are developed along streetcar lines or other transit service as the typology is especially suitable for streetcars, bus rapid transit or other high-quality bus service with closely-spaced stops (Reconnecting American and CTOD, 2008). On the other hand, Broadway southeast of Woodside Road has the identity of Special Use/Employment District as represented by the General Plan designation of the Commercial – Office Professional/ Technology with the Light Industrial Incubator Overlay. This type of district focuses on single-use for low to moderate density employment centers or a major institution such as the Stanford in Redwood City project. The Special Use/Employment District can have significant opportunities for mixed-use development if transit stations are well-connected to other parts of the region. Densities are often evenly distributed throughout the half-mile radius around stations (Reconnecting America and CTOD, 2008).

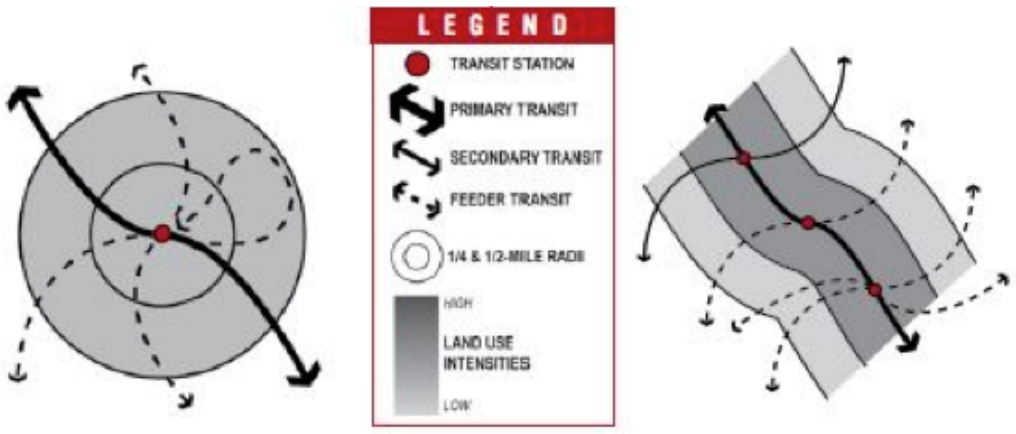


Figure 50. Diagrams of Special Use/Employment District (left) and Mixed-Use Corridor (Source: Reconnecting America)(right). (Source: Reconnecting America and CTOD, 2008).

COMPACT DEVELOPMENT

Compact development is one of the most important characteristics of a successful TOD. Designing a place with compact land uses provide comfortable walking distance of transit stations to housing, retail, commercial, offices, public services and amenities, and open spaces (see Figure 51). This allows pedestrians to have easy access to a wide variety of uses and offer an active and vibrant neighborhood where people have lots of opportunities to interact with each other and comfortably live, work, and play. Appropriate density practices, building height and massing, and context sensitivity are all essential for defining the corridor of development along the streetcar stops.

Figure 51. Compact land uses create a vibrant pedestrian-oriented development. (Source: World Property Channel, 2013).

DENSITY AND INTENSITY

Providing medium to high densities around streetcar stations is important in creating a pedestrian-oriented environment in transit-oriented developments. The highest density uses should be located directly adjacent to stations to support high frequency and rapid streetcar service (see Figure 52). This also provides a base for housing, employment, and services and amenities to support vibrant transit station areas. Medium and lower

densities may be designated in areas surrounding the immediate core station areas to provide a transition into low-density neighborhoods outside of the Broadway Corridor.

Figure 52. Streetcar route along high density development. (Source: Urban Places and Spaces, 2006).

With medium to high densities, location and context sensitivity must also be considered to reduce negative impacts on the neighborhood. Considerations for impacts of height on the mass and shadowing must be taken into account in order to reduce visual and environmental impacts. However, potential impacts can be mitigated through diverse building types, heights, and architecture detailing to allow an appropriate transition into the surrounding neighborhoods (see Figure 53).

Strategies:

- Establish residential density targets in station area plans to provide flexibility and encourage a variety of development intensities and heights;
- Enact minimum non-residential density and height requirements in station areas to ensure that development intensities in the core areas are transit-supportive and that

early phases of development are not built at exceedingly low densities;

- The highest intensity of development should be concentrated within the core area and adjacent to the transit station;
- Surface parking lots should be strongly discouraged adjacent to the transit station, except as a temporary or transitional use;
- Provide a transition between the core area and the surrounding area by stepping down the height of structures, reducing lot coverage, increasing open space, increasing architectural detailing, reducing permitted maximum densities, changes in use, or a combination of these methods;
- Encourage infill and redevelopment to achieve higher densities and a greater mix of uses;
- Discourage low-intensity, land-consumptive uses related to agriculture or heavy industry such as outdoor storage or construction staging; and
- Allow the project area for intensification of densities over time. (City of Calgary, 2005)
-

Figure 53. Various building types and height. (Source: Metrolink, 2014).

MIXED LAND USES

Station areas should also provide an appropriate mix of uses to offer a wide range of residential, employment, and activity choices. As the main purpose of creating TOD station areas is to limit automobile-oriented uses, it is essential to create an environment that meets people's daily needs by providing allowed uses that increase transit use and reduce traffic while prohibiting uses that attract automobiles and depend heavily of vehicular traffic. This can be achieved by including a minimum percentage of employment, retail, and residential uses for the station area overlay districts. In addition, medium- to high-density residential uses must be provided throughout the corridor. Providing housing as one of the prominent uses within overlay districts helps in meeting the housing demand and creates a population base that can actively support retail and commercial uses along the corridor (see Figure 54).

Figure 54. Vertical mixed-use buildings with housing. (Source: David E. Johnson PE, 2010).

Strategies:

- Promote a mix of complementary and transit-supportive residential, employment, and retail uses within station areas;
- Utilize a vertical mix of uses within the station area core to facilitate higher development intensities;
- Encourage the development of transit-supportive uses that provide a balance of service, entertainment, employment, and housing options that will make the station area a safe, inviting place to live, play, and work;
- Target uses towards an existing market demand within the context of the transit corridor and adjoining neighborhoods, rather than a pre-defined formula;
- Concentrate mixed uses in centrally located, high-visibility areas;
- Encourage active uses at the street level, such as shops and restaurants, where they can be easily viewed and accessed by pedestrians and transit patrons;
- Facilitate the incorporation of public facilities, such as schools, libraries, government service centers, recreation centers, and police substations in the station area;
- Discourage auto-oriented uses such as auto repair and service shops, big box retail, and drive-through fast food within the station area;
- Promote transit supportive design including smaller commercial footprints, reduced parking areas, and smaller building setbacks;
- Give priority to pedestrians and bicycles in building design and street layout;
- Incorporate a diversity of housing choices that includes a mixture of densities, styles, and price ranges;
- Vary housing mixtures according to the context of the greater station area; and
- Defined the appropriate variety of housing types based on existing and desired development patterns within the context of adjoining neighborhoods. (City of Calgary, 2005)

ALLOWED USES

Land uses in the station area overlay districts should encourage and support transit use with increased transportation network. Transit-supportive land uses around streetcar stations along the Broadway Corridor should be pedestrian-friendly so that these uses generate foot traffic (see Figure 55); encourage extended hours of activities to enhance

a sense of place and vibrant neighborhoods; and attract high number of employees and residential densities to increase transit users. The following uses are highly desirable in TOD station areas:

Figure 55. Mixed land uses that generate foot traffic. (Source: Minitime, 2014).

Employment uses

- Call centers
- Commercial office
- Light manufacturing contained within a building
- Research and development contained within a building
- Mixed-use office and retail (see Figure 56)

High school and post-secondary institutions

Residential – medium to high density

- Townhouses
- Walk-up apartments
- High-rise apartments

- Live-work units (see Figure 57)
- Mixed-use apartments (see Figure 58)

Retail

- Pedestrian-oriented street retail
- Shopping center retail with strong pedestrian connections (see Figure 59)

Services

- Child care facilities
- Fitness clubs
- Hotels of under 250 rooms or suites (see Figure 60)
- Medical clinics
- Personal services
- Restaurants
- Banks

Entertainment, recreational, and cultural facilities

- Library
- Movie theaters
- Recreational centers
- Civic and community meeting facilities

Figure 56. Mixed-use of offices and retail. (Source: HDR, n.d.).

Figure 57. Mixed-Use Development Example (Source: Washington City Paper, 2010)

Figure 59. Pedestrian-oriented retails. (Source: Voice of San Diego, 2013).

Figure 60. Boutique hotel. (Source: Splendia, 2014).

ALLOWED USES WITH SPECIAL PERMIT

Light Industrial

- Warehousing or distribution activities

Services

- Hotels of more than 250 rooms or suites
- Hospitals

Retail

- Retail of any area as a single use in a detached one- or two-story structure
- Laboratory or research facilities

PROHIBITED USES

As the focus of TOD is the transit ridership and pedestrians, it is important that auto-oriented development does not overwhelm the station area. Non-transit supportive land uses are oriented primarily to the automobile and not the pedestrian or transit user. These types of land uses are heavily automobile-dependent and general high number of vehicular activity. In addition, these uses rely on parking lots to accommodate heavy traffic, which

also leads to consuming a large amount of land in low-densities. Non-transit support uses that should be prohibited along the Broadway Corridor include:

Stand-alone auto-oriented uses and formats

- Automotive parts, repair and services
- Car dealerships (see Figure 61)
- Car washes
- Drive through facilities (see Figure 62)
- Gas/service stations
- Commercial surface parking
- Adult-oriented business
- Self or mini storage

Low intensity industrial

- Outdoor storage
- Junk yards

Low density commercial

- Big box retail (see Figure 63)
- Large format grocery stores
- Strip commercial development

Low density residential

- Single detached on standard or large lots (see Figure 64)
- Recreational vehicle parks

Figure 61. Car Dealership Example. (Source: Audi Piano, n.d.)

Figure 62. Drive-Thru Facility Example. (Source: Meoli Companies, n.d.)

Figure 63. Big Box Retail Example. (Source: Alter Net, 2013)

Figure 64. Single-Family Home Example. (Source: Ryland Homes, 2014)

URBAN PARKS AND OPEN SPACE

As transit-oriented development support high-density development and compact mixed-uses, urban parks and open spaces should be integrated into the Broadway Corridor project area in order to enhance livability and encourage active lifestyle. Open spaces that are provided along with multi-modal and complete streets in transit station areas create a vibrant public realm that emphasizes pedestrian activities. Moreover, green spaces are major contributors to the aesthetic quality of urban neighborhoods as well as physical and social well being of residents, employees, and visitors.

Urban parks and open space can be created in a wide range of designs and sizes; however, providing small- to medium-scale green spaces throughout the corridor would be more ideal than providing large open spaces. These smaller spaces are more desirable, because they create a sense of place and provide areas to relax, engage, and enjoy without occupying huge amount of land. As the majority of the Broadway Corridor's parcels are fully developed, small- to medium-sized spaces are more ideal for this project area as well. In addition, small and quaint green spaces that are located throughout the corridor can increase connectivity and provide a walk shed within the project area (see Figure 65).

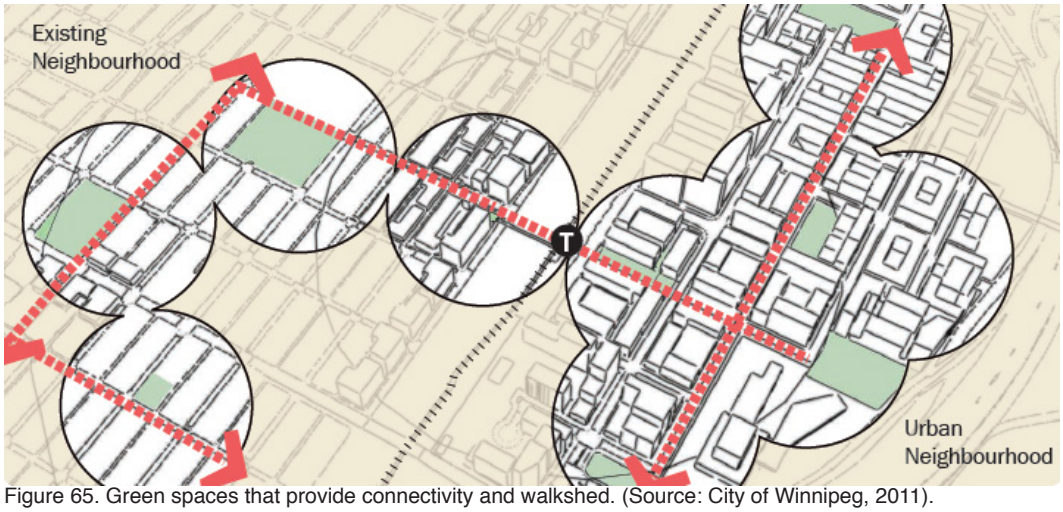


Figure 65. Green spaces that provide connectivity and walkshed. (Source: City of Winnipeg, 2011).

The following section illustrates various urban park typologies that are ideal for the Broadway Corridor.

Pocket Park

A pocket park, also known as a vest pocket park, is a small outdoor space, usually no more than ¼ of an acre and only a few house lots in size or smaller. This type of park is located in an urban area surrounded by commercial buildings or residential uses (see Figure 66). Although these parks are small in size, they provide a variety of functions to meet the needs of residents including event venues, play areas for children, gathering, relaxing, and lunch breaks for employees (see Figure 67). The success of pocket parks depends on four qualities: easy accessibility, activities, comfort and convenience, and sociable (National Recreation and Park Association, n.d.) (see Figure 68 and Figure 69).

Figure 66. Pocket park surrounded by office buildings. (Source: Skinny Office, n.d.).

Figure 67. Pocket park between residential units for families and residents. (Source: USC, n.d.).

Figure 68. Pocket Park/Open Space Example. (Source: P Base, 2009)

Figure 69. Pocket park inbetween office buildings. (Source: Skyscraper City, n.d.).

Neighborhood Park

A neighborhood park is a medium-sized landscaped public space for active and passive recreation, which may include seating area and recreational facilities for public use. The size ranges from five to 10 acres and usually reflects the surrounding context (see Figure 70). In addition, as neighborhood parks attract a wide range of community members including children and elderly, surrounding development should incorporate “eyes on the street” principles and enhance a sense of safety and security (see Figure 71).

Figure 70. Neighborhood park. (Source: Inhabitat, 2012).

Figure 71. Neighborhood park. (Source: PJ Dick, n.d.).

Parklet

A parklet is a recent green trend that repurposes part of a street into a green space (see Figure 72). Although they are intended for aesthetic enhancements to the public realm, they also function as public open space with amenities such as seating area, planting, bike parking, and art (see Figure 73). Parklets promote sustainable streets with landscaping and encourage walking and biking. In addition, they preserve economic vitality and activity, especially in a transit-oriented development, as parklets attract pedestrians to linger and socialize (City and County of San Francisco, 2013) (see Figure 74).

Figure 72. Parklet example. (Source: Livability, 2013).


Figure 73. Parklet with amenities including games, planters, and seating. (Source: AN Blog, 2013).

Figure 74. Parklet relacing on-street parking spaces. (Source: Arizona Highways, 2014).

BOUNDARIES OF THE OVERLAY DISTRICT AND CORE AREA/ STATION AREA TYPES

The Broadway Corridor project area is divided into three station area overlay districts. The first district is the Maple Plaza located between Maple Street and Chestnut Street. This district currently has a wide variety of land uses ranging from medical facilities, multi-story residential apartments, business offices, and commercial retail uses. The second district is the Broadway Central as shown in. This area is an essential part of the corridor as it serves as the gateway into the project area and adjacent neighborhoods in the City. The third district is the Business Park located adjacent to the Stanford in Redwood City project. Currently, this district contains land uses that have potential to attract future businesses and industrial uses to boost local economy and create a synergetic effect with the adjacent Stanford development. Figure 75 illustrates overlay district areas.

Figure 75. Project area and the three TOD overlay districts.

Maple Plaza

Maple Plaza is intended for a balanced and mixed use of residential and neighborhood commercial. The major function of transit stations in this district is to help residents, employers, and visitors who live nearby commute to work and provide easy access to shopping, entertainment, school, and other necessary daily functions. In addition, Maple Plaza station district should make Downtown, Stanford project, medical services, and other local destinations accessible through extended transit network. Residential units should focus on mid- to high-density uses with readily available commercial uses within a quarter-mile radius to emphasize location efficiency and encourage pedestrian activities.

The core area of the Maple Plaza district is located directly adjacent to the Broadway Corridor with multi-family and neighborhood-scale mixed-uses that provide housing, retail, restaurants, and service-oriented uses. Parcels that surround the core area should provide medium- to high-density residential uses for multi-family apartments or live/work units.

Table 5: Maple Plaza Land Use and Intensity Guidelines

Maple Plaza Land Use and Intensity Guidelines		
	Core area directly adjacent to Broadway Corridor	Station area surrounding the Broadway Corridor core area
Existing Zoning	Mixed-Use Corridor Streetcar Broadway (MUC-SB); Mixed-Use Neighborhood (MUN)	High-Density Residential (R-5); Medium-Density Residential (R-4); Planned Community District (P); Commercial Office (CO)
Proposed Zoning	Mixed-Use Corridor Streetcar Broadway (MUC-SB); Mixed-Use Neighborhood (MUN)	High-Density Residential (R-5); Medium-Density Residential (R-4); Neighborhood Commercial District (CN)
Ideal Land Use Mix	Multi-family and/or neighborhood-scale mixed-use with retail, restaurant, and service-oriented uses. Multi-unit, mid- to high-rise structures with ground floor uses that are compatible with residential uses. Vertical mixed-use is common.	Multi-family apartments and/or live-work units. Transition from high-density within the transit station area to high- to medium-density outside of 1/8-feet radius.
Floor Area Ratio	0.8 to 1.0 FAR	0.6 FAR
Residential Units	40 to 60 dwelling units per acre	20-30 dwelling units per acre
Height	Mixed-Use: 4-6 stories	Commercial: 2 stories Residential: 3-4 stories

Broadway Central

The Broadway Central district is located at the core of the Broadway Corridor project area, acting as the major gateway into the City as well as the corridor. The core area of this district is located directly adjacent to the Broadway Corridor and should be the most intensely developed among the three districts with stations surrounded by a mix of urban uses. High-rise construction is the most desirable and mixed-uses should be both vertical and horizontal. This district allows a more variety of uses than the Maple Plaza district with institutional, employment, hotel, and civic uses. Residential uses are also allowed and encouraged through live/work units to accommodate existing and potential employees within the area and who commutes to nearby neighborhoods.

The parcels surrounding the Broadway Central core area should allow commercial uses as well as light industrial uses with special use permits. Although transit-oriented development discourages the use of light industrial uses, the existing industrial uses have a vital role in the City's local economy. Therefore, these parcels should allow light industrial uses to provide flexibility and preserve economic vitality with already-existing industrial uses.

Table 6: Broadway Central Land Use and Intensity Guidelines

Broadway Central Land Use and Intensity Guidelines		
	Core area directly adjacent to Broadway Corridor	Station area surrounding the Broadway Corridor core area
Existing Zoning	Mixed-Use Corridor Gateway Broadway (MUC-GB); Light Industrial Incubator (LII-S)	Light Industrial Incubator (LII-S)
Proposed Zoning	Mixed-Use Corridor Gateway Broadway (MUC-GB); Mixed-Use Live/Work District (MULW); Commercial Park District (CP)	Light Industrial Incubator (LII-S); Commercial Park District (CP)
Ideal Land Use Mix	Downtown-scale mix of employment (office), institutional, hotel, and civic uses. Allow a wide range of ground floor uses including commercial and office spaces. High-density housing may also be permitted with live/work units.	Provide flexibility in uses to permit offices, commercial, and light industrial uses to keep existing character and economic vitality by preserving already-existing light industrial uses away from the Broadway Corridor.
Floor Area Ratio	Commercial Park Uses: 0.8 FAR Live/Work Units: 2.0 FAR Mixed-Use Commercial: 1.0 FAR	Commercial Park Uses: 0.8 FAR Industrial Uses: 0.75-1.0 FAR
Residential Units	Live/Work Units: 20 dwelling units per acre Mixed-Use:40-60 dwelling units per acre	Not Applicable
Height	4-6 stories	Commercial Park: 4-6 stories Industrial: 2-3 stories

Business Park

The Business Park district is located in between the Stanford in Redwood City development and the Broadway Central gateway district. This district is intended for a combination of commercial, offices, and live/work units to provide a dense mix of housing and employment types. This area will primarily be an employment district with moderate to high density with a focus on economic activity. Entertainment venues and commercial uses are also desirable within this district in order to provide activities and generate foot traffic while promoting transit use. In addition, a mix of land uses with office and commercial with entertainment will provide lingering activities for residents, employees, and visitors even after 9 am to 5 pm work hours.

Similar to the Broadway Central district, surrounding parcels of the Broadway Corridor core area should allow light industrial uses with special use permits to preserve economic vitality and support local economy.

Table 7: Business Park Land Use and Intensity Guidelines

Business Park Land Use and Intensity Guidelines		
	Core area directly adjacent to Broadway Corridor	Station area surrounding the Broadway Corridor core area
Existing Zoning	Light Industrial Incubator (LII-S)	Light Industrial Incubator (LII-S)
Proposed Zoning	Commercial Park District (CP); Professional Office District (PO); Commercial Office District (CO); Mixed Use-Live/Work District (MULW)	Light Industrial Incubator (LII-S)
Ideal Land Use Mix	Primarily employment uses such as commercial and office with live/work units to provide housing for employees. Entertainment venues and commercial uses are also encouraged to allow uses to stay open after 9 am to 5 pm work hours.	Allow industrial uses with use permits to preserve economic vitality of existing light industrial uses.
Floor Area Ratio	Commercial or Office Use Only: 0.8 – 1.0 FAR Live/Work Offices or Commercial Use Only: 2.0 FAR	0.7-1.0 FAR
Residential Units	Live/Work units: 20 dwelling units per acre	Not Applicable
Height	3-6 stories	2-3 stories

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