

APPENDIX

FIRST LAST MILE STRATEGIC PLAN

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MODAL ACCESS TARGETS TECHNICAL MEMORANDUM

TAXONOMY OF MOBILITY DEVICES

CASE STUDY SITES

STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

- > Multiple modes
- > Multiple constituencies (gender, age, abilities, etc.)

Name of station: _____

Date/Time/Weather conditions during visit: _____

Station Typology: _____

1. SAFETY

Disagree/
Lacking Somewhat/
Adequate Strongly
Agree/Ample

1.1 Adequate lighting. (Night survey required)

Regularly spaced and frequent lighting that is directed towards the sidewalk and any bikeways, which provides sufficient illumination. Potential obstacles marked with reflectors or lighting.

1 2 3 4 5

1.2 Eyes-on-the-street.

Presence of highly transparent ground/floors, windows, and entries.

1 2 3 4 5

1.3 Well maintained public realm.

Sidewalks are smooth and without cracks, vegetation is trimmed, etc.

1 2 3 4 5

1.4 Safety buffer for bikes.

Bikes are adequately set back from vehicles. Consider type and quality of buffer – sufficient width, painted material, vertical separation, such as bollards.

1 2 3 4 5

1.5 Safety buffer for pedestrians.

Pedestrians set back from travel lanes via ample sidewalk width, landscaping, and street furniture.

1 2 3 4 5

1.6 People-friendly traffic speeds and manners.

Drivers yield to pedestrians and traffic is slowed via narrow roadways, markings, no turn on red lights, etc.

1 2 3 4 5

1.7 Clear safety signage.

Pedestrians set back from travel lanes via ample sidewalk width, landscaping, and street furniture.

1 2 3 4 5

1.8 Overall, the station area feels safe.

Overall, there is a feeling of safety as you walk through the station area. Consider the safety of all users – especially women, children, and the elderly. Consider both day and nighttime safety.

1 2 3 4 5

TOTAL SCORE

_____ / # questions answered

=

STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

- > Multiple modes
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2. AESTHETICS

Disagree/
Lacking Somewhat/
Adequate Strongly
Agree/Ample

2.1 Sense of place.

Inclusion of unique street characteristic, landmarks, striping or a navigable streetscape hierarchy that sets this space apart from other areas.

1 2 3 4 5

2.2 Pleasant landscaping.

Consistent landscaping that provides ample shade. Trees are well maintained and all tree wells are planted with street trees.

1 2 3 4 5

2.3 Strategically placed pedestrian amenities.

There are a variety and sufficiently provided pedestrian amenities (seating, trash cans, water fountains) that are well maintained and inviting. Kiosks and vendors are present on pedestrian paths, are visually pleasing and are located in areas that do not interfere with foot traffic.

1 2 3 4 5

2.4 Pedestrian unfriendly elements are limited.

There are a general lack of the following: unpleasant smells, blank walls, vacant lots, fences, noise pollution, unfriendly street conditions, trash.

1 2 3 4 5

2.5 Pleasant experience.

Overall, there is a pleasant ambiance as you walk, bike, or use alternative transit throughout the station area. Consider the experience of all users – especially **women, children, and the elderly**. Consider both day and nighttime amenities. Care has been taken to make a nice environment for all users.

1 2 3 4 5

TOTAL SCORE

_____ / # of questions answered
=

_____ (Average score on aesthetics)

STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

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3. ACCESSIBILITY

3.1 High quality sidewalks

Sidewalks are large enough for pedestrians to walk, pass, and jog comfortably in opposing directions. There are very few disruptions to the sidewalk quality (e.g. smooth surface paving, signage and poles are set back from the pedestrian right-of-way).

Disagree/
Lacking Somewhat/
Adequate Strongly
Agree/Ample

1 2 3 4 5

3.2 Clear, safe crossings.

Signalized intersections allow ample time to cross, frequently allow passage, are a walkable distance (or provide a pedestrian refuge or median), are supplied with functioning push buttons, have minimal street crowns and are painted for safety.

1 2 3 4 5

3.3 Seamless transit mode transfer.

Transferring to alternate modes of transit is streamlined through the presence of well-marked, nearby, and obvious pathways.

1 2 3 4 5

3.4 Operating and sufficient bicycle facilities.

Bicycle facilities allow sufficient room, have a smooth surface, and provide riders with bike lanes, routes, pathways, adequate marking, parking, separated push buttons, bike stations and bike boxes.

1 2 3 4 5

3.5 High quality signage.

Signage is located in clear view for pedestrians, bicyclists, and other transit modes. Signage provides clear directional and locational information, regulatory warnings, and station area identity.

1 2 3 4 5

3.6 Parking and drop-off is streamlined.

Adequate number of parking spaces (in park-and-ride if applicable), room for drop-off (kiss-and-ride) on street parking serves as a buffer for pedestrians, parking time restrictions are in effect where necessary, and vehicles are prohibited from blocking the pedestrian right-of-way.

1 2 3 4 5

3.7 Curbs and curb ramps are provided.

Curbs and curb ramps are present at all crossings and have a gentle slope.

1 2 3 4 5

3.8 Navigating the public realm is intuitive and easy.

Overall, there are a series of passageways that are frequent and well-marked as you walk through the station area. Consider the experience of all users – especially women, children, and the elderly. Consider both day and nighttime linkages.

1 2 3 4 5

TOTAL SCORE

_____ / # of questions answered

=

STATION AREA CHECKLIST

For each of the quality criteria, rank the station area based on how adequately or poorly it provides amenities, connections, and a transit-supportive environment for riders.

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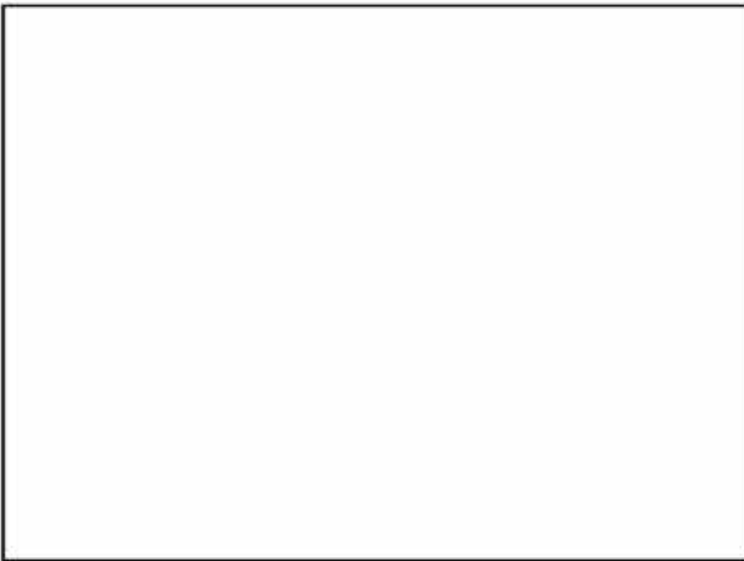
ROUTE TAKEN

Include a blank map and note route taken during site visit

Additional opportunities & constraints:

Insert additional narrative from site findings.

PHOTO DOCUMENTATION



Description of photo, keyed to issue number (e.g. 2.5) in checklist



Description of photo, keyed to issue number (e.g. 2.5) in checklist

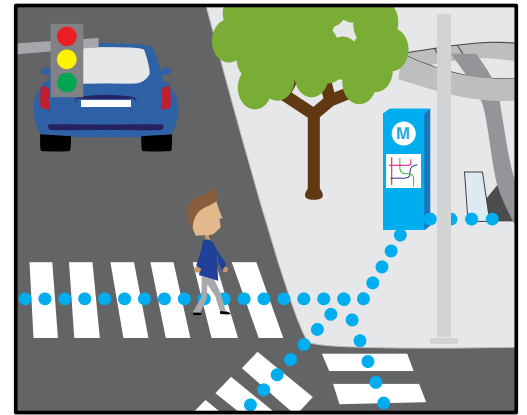
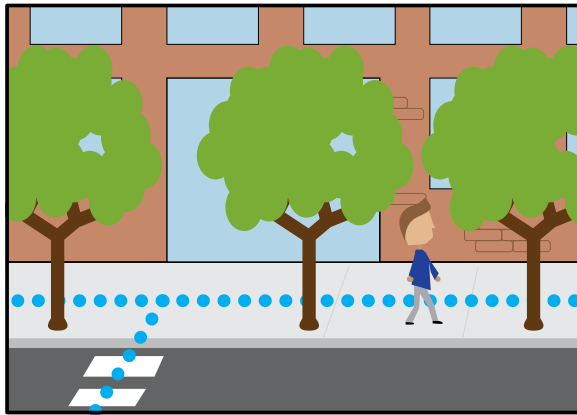
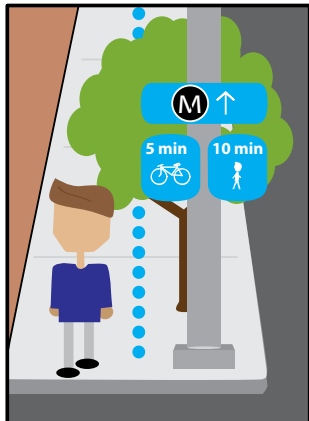
NOTE: Add pages for additional relevant photos

PHOTO DOCUMENTATION CONTNUED

THE MEET-UP!

In sunny downtown LA, we join Jeff in the middle of making plans to catch up with his long-time friend Bret...

Sounds good, I haven't been to LACMA in a while...the Pathway?
Hmm...I'll check it out.
See you soon!

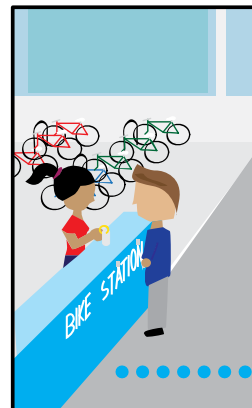
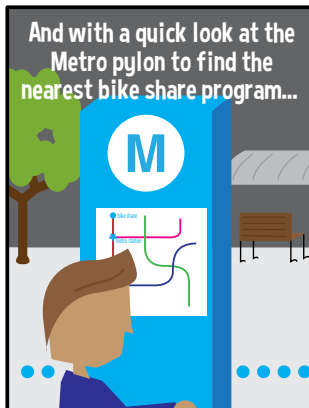


JEFF SETS OFF ON THE PATHWAY, following the signs to get to his nearest Metro station.



A SHORT AND SPEEDY METRO RIDE LATER...

And with a quick look at the Metro pylon to find the nearest bike share program...



Jeff is off biking!



READY TO SPEND A GREAT DAY WITH HIS FRIEND!

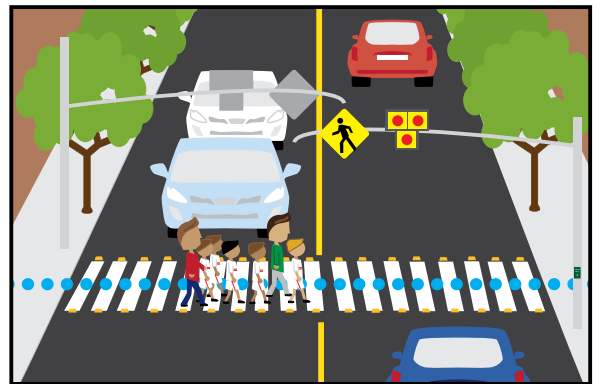
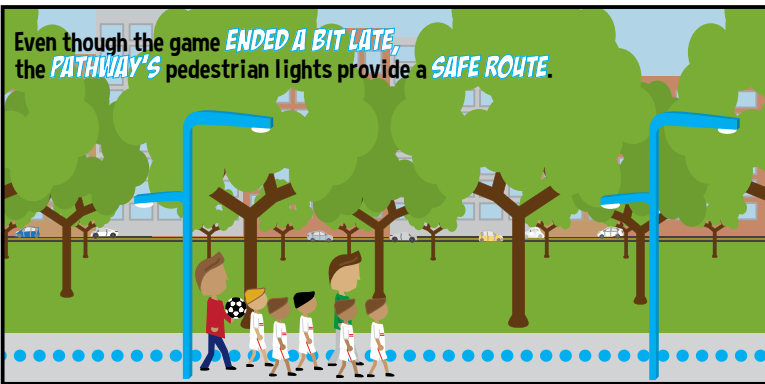


THE TEAM TRIP!

After being named the new junior soccer league champions, the team decides to celebrate with a treat - ice cream!



Even though the game **ENDED A BIT LATE**, the **PATHWAY'S** pedestrian lights provide a **SAFE ROUTE**.



Did you see that goal?!
The goalie didn't stand a chance!

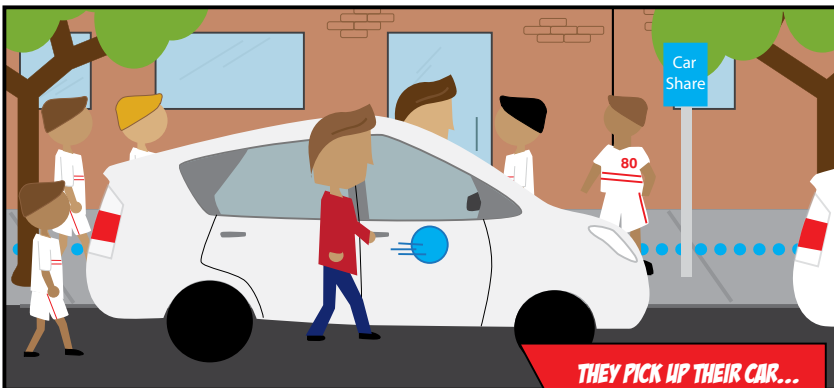
MEANWHILE, COACH MAKES
CAR SHARE RESERVATIONS.



I hope they
have rocky road!

ON THE TRAIN, THE BOYS
STILL CAN'T STOP TALKING
ABOUT THEIR GREAT GAME...

...OR THINKING ABOUT
WHICH FLAVOR ICE CREAM
THEY WANT.



THEY PICK UP THEIR CAR...



...AND GET THEIR SWEET TREATS!

GRANDMA TO THE RESCUE!

A **HARD-HITTING STORY** has just been received at LA Weekly, and Julia won't be able to pick up her kids on time.

But she knows **WHO TO CALL...**

Mom!
Can you pick up
the kids?

I'm on my way!

GRANDMA SETS OFF ON HER SCOOTER!

RAMPS AND ELEVATED CROSSWALKS
KEEP HER SAFE AND MOVING

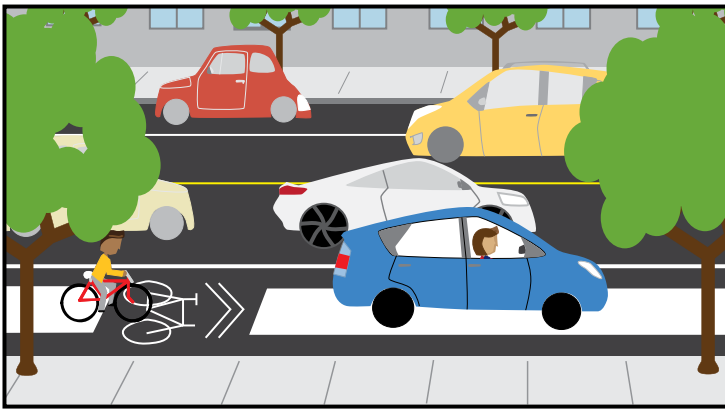
AN ELEVATOR GETS HER TO THE PLATFORM

Race you home
Grandma!

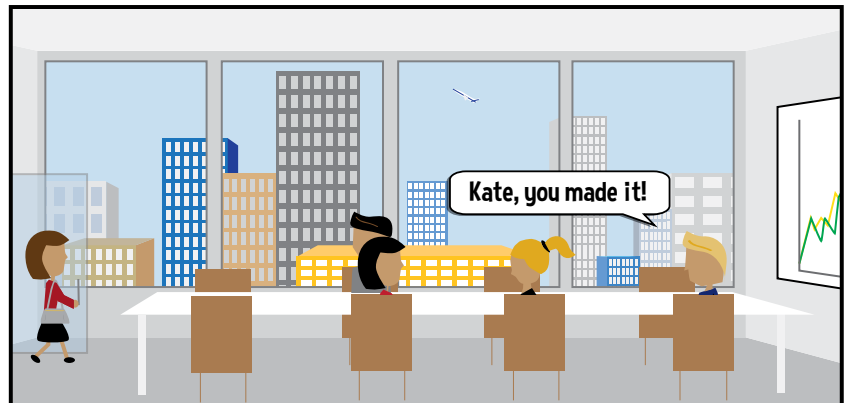
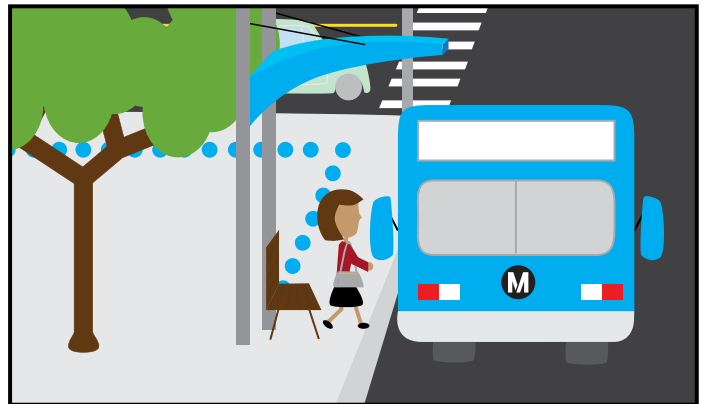
POP MEETING!

It's breakfast at the Lim's, and Kate received an **URGENT CALL** from the **OFFICE**...

I need to be in the office in 20 minutes. Can you drop me off at the Metro station?



KATE HAS EXTRA TIME TO PREPARE FOR HER MEETING.





FIRST LAST MILE

STRATEGIC PLAN

Planning Context Review



Task 3.1 – Review RTP/SCS
Task 4.2 - Best Practices Compilation & Review

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Planning Context Review

Executive Summary

State-Wide Policy Context

California's Assembly Bill 32, The Global Warming Solutions Act of 2006, was the first statewide plan enacted to mandate reductions of greenhouse gas emissions. The legislation requires the State to reduce greenhouse gas emissions to 1990 levels by or before 2020. It also directs the California Air Resources Board (CARB), which establishes targets for 2020 and 2035 for each region covered by one of the State's 18 metropolitan planning organizations (MPOs), to develop discrete early actions to reduce greenhouse gases and to prepare a scoping plan to identify how best to reach the 2020 target.

Senate Bill 375, California's Sustainable Communities and Climate Protection Act, was enacted in 2008 in response to AB 32 as the legal mechanism to achieve greenhouse gas emission reduction targets. SB 75 is a state law that requires the metropolitan regions of the state to reduce greenhouse gas emissions through their planning process and enhances California's ability to reach its AB 32 goals by promoting sustainable community planning, most notably by making explicit the link between land use and transportation planning policies.

Regional Policy Context- 2012 RTP/SCS

The Southern California Association of Governments (SCAG) is the planning authority for six counties: Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura; and is the lead agency in facilitating the development of the Regional Transportation Plan (RTP). SCAG's RTP is a comprehensive long-range transportation plan that identifies transportation strategies to address the mobility needs of Southern California. The RTP must be updated every four years in order to qualify the region's transportation projects for federal and state funding. In 2012 SCAG updated the RTP and included a Sustainable Community Strategy (SCS) to facilitate the requirements of SB 375. Combined with the RTP, the SCS is a vision for growth based on mobility, economy, and sustainability.

The 2012 RTP/SCS provides the foundation for an effective First Last Mile Strategy. Chapter 01 outlines a vision for the region and includes a clear definition of mobility:

A successful transportation plan allows the residents of the region to access daily needs, including work, school, shopping, and recreation, without undue burdens of cost, time, or physical danger. This includes the pressing need to preserve and maintain our infrastructure at adequate levels. Residents should be able to rely on their ability to get from one place in the region to another in a safe and timely manner. They should be able to choose from a variety of transportation modes that suit their preferences and needs, including active, non-motorized modes such as biking and walking that allow for physical activity and greater health.

2012 Regional Transportation Plan, p.12

Future Context

The regions daily access needs will become even more pressing, as Los Angeles County expands over the next 30 years. As Southern California pulls out of the recession, and the economy is on the mend, we are reminded how critical a functional transit system is to allow residents access to a wide range of job markets. The region is expected to grow by 4 million people in the next 30 years, and with it will bring a growing demand to move both people and goods. There are a number of factors that will contribute to Los Angeles County's ability to address the new demand, as it relates to demographic changes, economy, mobility, and a sustainable future.

Not only will the region see a significant increase in the population in the next 30 years, but the aging Baby Boomer generation will increase the share of the 65+ population from 11% to 18% by 2035, and the working-age population will decrease. These shifts will increase the labor forces' dependency on transit, and increase the demand for development types such as multifamily and infill housing in centralized locations. The region plans to add over 1.5 million households, of which over 50% will be within High-Quality Transit Zones (HQTAs); this development pattern will rely on the addition of jobs near transit to balance the job-housing ratio, and provide complete communities with access to transit to all segments of the population.

Transportation Investments and Measure R

Investing in transportation infrastructure throughout Southern California in the coming years is a strategy to improve the regions mobility while re-invigorating its economic vitality. According to the 2012 RTP/SCS, over 174,500 new jobs will be generated by construction and operations, and an additional 354,000 jobs will be created annually in the broad cross-section of industries that will result from increased competitiveness throughout the region. This expansion, utilizing Measure R funding, will include dozens of critical transit and highway projects, Metro Link and Metro Rail Line extensions, and larger intercity rail service increases to support the region's growing transportation demand while infusing an estimated \$32 billion back into the local economy.

Metro Expansion and Sustainability

Los Angeles County Transportation Authority (Metro) is taking an active role in responding the greenhouse gas emission reduction targets with the approval of the Health and Active Transportation Motion (April 2011) and the development of the Active Transportation Agenda (November 2011). These efforts represent first steps in creating a standard of excellence for design across the agency that will ensure that all types of transportation investments contribute to a future urban form that encourages walking, biking, and transit use. The Agenda includes eight objectives to advance active transportation which are addressed by the advancement of new short and longer-term strategies. The Health and Active Transportation Motion recognizes the goals of the Sustainable Communities Strategy, a component of SCAG's Regional Transportation Plan, as opportunities to establish transit-supportive land-use patterns and improve regional accessibility with low-cost, non-polluting alternatives. Metro, through this motion, supports creating healthier and more sustainable communities with alternatives to driving that incorporate physical activity into daily life.

The First Last Mile Strategic Plan advances the objectives established by Metro's Board to promote active transportation, and implements Metro's Active Transportation Agenda by providing technical analysis to support the development of an Active Transportation and Design Policy by May 2013. The Plan will provide a framework for strategically investing Metro resources and the basis for seeking additional funds to extend the station area and expand the reach of transit in communities. The underlying land use, socioeconomic, and transportation data provided in existing documents are key components to the technical analysis that support the expansion of the transportation network and design policies that improve first mile/last mile connectivity. Developed by regional players, such as institutions, government agencies, and metropolitan planning organizations, the reviewed documents include policy, process, implementation, funding, and reference design guidelines.

Following this introduction are summaries of a number of important planning documents starting with a more detailed look at the 2012 RTP/SCS. The First Last Mile Strategy exists in a context of on-going planning efforts; the ability to build on the ideas and efforts of regional and national planners and designers will only strengthen the work.



Regional Transportation Plan (RTP)/Sustainable Community Strategy (SCS)

April 2012

The Regional Transportation Plan (RTP) is a long-range transportation plan that is developed and updated by the Southern California Association of Governments (SCAG) every four years. The RTP provides a vision for transportation investments throughout the region. The Sustainable Communities Strategy (SCS) is a newly required element of the Regional Transportation Plan (RTP). The SCS will integrate land use and transportation strategies that will achieve CARB emissions reduction targets.

The region wastes over **[3 million]**
hours each year sitting in traffic

[21 %] of all traffic-related fatalities
involve pedestrians

State and federal gas taxes have not change in
nearly **[20]** years

Yet, highway construction costs
have grown by **[82 %]**

Rail operating costs have increased by
over **[40 %]** in the past decade

Intercity transit operators have been forced
to cut service by up to **[20 %]**

The Regional Transportation Plan provides the framework for land use, socioeconomic data, and transportation analysis that are key components to the technical analysis of the existing and future transportation network. The success of land-use and transportation changes, outlined in the RTP/SCS, will be largely driven by respective actions of local governments and transportation commission's such as Metro. Engagement with a larger scope of strategies will be critical in order for the region to experience long-term benefits. SCAG performed a careful analysis of the transportation network, including outreach with stakeholder agencies and planning sessions with residents, which culminated into a shared vision for the region's sustainable future. The vision has been shaped by many entities, and is addressed Southern California's mobility, economy, and sustainability. Southern California is currently home to 18 million people, and is considered by some to be crowded, congested, and expensive. Over the next 25 years Southern California is expected to accommodate an additional 4 million people, putting additional pressure on the already congested transportation system, communities and neighborhoods, and the environment. The economic downturn (with the loss of 800,000 jobs in the region) will continue to impact housing options for Southern California residents, effecting their commute choices and frequency. Exacerbating this increase in commuter trips, projected population growth for the region will occur primarily in suburban counties, furthering the imbalance of the jobs to housing ratio in those areas.



The Southern California Association of Governments (SCAG) has prepared Regional Transportation Plans (RTPS) for the past three decades, increasing mobility for the region has always been the primary goal; however, the regions current challenges require the accommodation of additional growth, while providing improved quality of life, a resilient economy, and a healthy environment. The challenges facing the region are expansive; the region’s roadways are the most congested in the nation, multi-modal fatality rates are high, the air quality is poor, and the costs provide major obstacles. To address these challenges, SCAG has worked with the key regional players to create a vision of growth based on mobility, livability, prosperity, and sustainability. This vision is included in the RTP as the Sustainable Communities Strategy (SCS); the SCS considers the transportation needs of the growing region and the planned transportation network to set forth a future land use pattern that will help meet GHG emission reduction targets in compliance with federal law for developing an RTP. The RTP/SCS builds on the backbone of the region’s economic well-being, the multimodal transportation system that the region has invested in over the past few decades.

THE SYSTEM AT A GLANCE

- [21,690]** miles of highways and arterials
- [470]** miles of passenger rail
- [6]** air carrier airports

THE REGION IN MOTION

- [446 million]** miles driven each day
- [81 million]** air passengers each year
- [45%]** more urban rail riders between 2000-2006
- [34%]** of our jobs depend on the goods movement industry



The SCS takes an integrated approach to addressing the region's challenges, with strategies that respond to projected growth, housing needs, changing demographics, and transportation demands. The goals of the SCS reach beyond the reduction of GHG emissions by building on and refining the regional blueprint that SCAG began in 2000, addressing ongoing issues such as placemaking, the cost of living, the environment, health, responsiveness to the marketplace, and mobility. The proposed transportation network expansion is supported by the land use development pattern, which focuses new housing and job growth in high-quality transit areas, and the transportation demand management measures in the SCS.

The SCS addresses the needs of the region, by utilizing broader definitions of mobility, economy, and sustainability; where the integration of land use planning and transportation provide improved access, create jobs, and reduces GHG emissions through not only the expansion of the transportation network, but the redistribution of residences, commercial corridors, and industry clusters and the efficiency of movement of goods and people throughout the region. Offering a variety of transportation modes to suit all preferences and needs, the plan proposes over \$524 billion of investment in the next 25 years, constituting the largest infrastructure jobs program in Southern California's history. To guide these investments through projects, programs, and strategies, the SCS has specific goals that carry out the vision that reflect the wide range of challenges identified. The following goals have been approved by the RTP Subcommittee, and will be adopted by the Regional Council as part of the 2012-2035 RTP/SCS:

We will reduce greenhouse gas emissions by **[9%]** by 2020,
and by **[16%]** by 2035

We will generate **[500,000]** jobs per year

Over **[twice]** as many households will live near high-quality transit

We will get **[\$2.90]** back for every \$1 spent

The RTP/SCS is a performance-based plan that allows the regional goals to be quantified and investment impacts to be estimated, and re-evaluated over time. The performance measurements are based on previous successes and will be refined and expanded upon to meet policy objectives, as needed.

RTP/SCS Goals	Mobility/Accessibility	Reliability	Location Efficiency	Productivity	Safety and Health	Economic Well-Being	Cost Effectiveness	System Sustainability	Environmental Quality
Align the plan investments and policies with improving regional economic development and competitiveness						✓			
Maximize mobility and accessibility for all people and goods in the region	✓						✓		
Ensure travel safety and reliability for all people and goods in the region		✓			✓				
Preserve and ensure a sustainable regional transportation system								✓	✓
Maximize the productivity of our transportation system	✓			✓					
Protect the environment and health of our residents by improving air quality and encouraging active transportation					✓				✓
Actively encourage and create incentives for energy efficiency, where possible			✓						
Encourage land use and growth patterns that facilitate transit and non-motorized transportation			✓						
Maximize the security of the regional transportation system through improved system monitoring, rapid recovery planning, and coordination with other security agencies*									

Utilizing local general plans, recent planning assumptions, and the two sub-regional Sustainable Communities Strategies prepared by the Gateway Cities Council of Governments (GCCOG) and Orange County Council of Governments (OCCOG), the SCS was developed around four key building blocks: land use, transportation networks, transportation demand management, and transportation system management programs and policies.

The Land Use Pattern accommodates the region's future employment and housing needs and protects sensitive habitat and resource areas while planning for additional housing and jobs near transit. The land use pattern was developed using five community types and Transportation Analysis Zones (TAZs) to identify localized effects of the interaction of land use and transportation. The resulting policies consider density of residential areas, centrality of employment districts, convergence of transit facilities, capacity of non-auto infrastructure, and multi-modal connectivity such as active transportation. These components are used to develop land use patterns with additional High-Quality Transit Areas (HQTAs) where jobs and housing are within a walkable distance to a transit village, within a half-mile of a well-served transit stop, and which include transit corridors with frequent service during peak commute hours. HQTAs provide the framework for new land use zones such as "Pedestrian-Oriented Transit Zones" (POTs).

The SCS outlines requirements that lay a regional policy foundation for local governments to build upon, which integrate transportation and land use strategies to meet GHG-reduction targets. Local governments should:

- Identify existing land use,
- Identify areas to accommodate long-term housing needs,
- Identify areas to accommodate an eight-year projection of regional housing needs,
- Identify transportation needs and the planned transportation network,
- Consider resource areas and farmland,
- Consider state housing goals and objectives,
- Set forth a forecasted growth and development pattern, and

The review of local plans and subregional strategies identified recent trends that support the goals of the SCS with an overall land use pattern. Along with planning for additional housing and jobs near transit, the land use plan allows for changing demands in types of housing, ensures adequate access to open space, and continues to incorporate local input for future growth. The land use pattern accommodates approximately 644,000 additional households by 2020, and an additional 1.5 million households by 2035, while encouraging a more balanced job to housing ration by adding 676,000 jobs by 2020 and 1.7 million by 2035. The integrated land use and transportation planning strategy outlined in the SCS allows for better place making, lower costs to taxpayers, public health and environmental improvements, and a responsiveness to the economic climate, reaching a broader scope of goals than improvement to access and mobility alone.

Table 4.3 Land Use Actions and Strategies

Proposed Action/Strategy	Responsible Party(ies)
Coordinate ongoing visioning efforts to build consensus on growth issues among local governments and stakeholders.	SCAG
Provide incentives and technical assistance to local governments to encourage projects and programs that balance the needs of the region	SCAG
Collaborate with local jurisdictions and agencies to acquire a regional fair share housing allocation that reflects existing and future needs.	SCAG, Local Jurisdictions, HCD
Expand Compass Blueprint program to support member cities in the development of bicycle, pedestrian, Safe Routes to Schools, Safe Routes to Transit, and ADA Transition plans.	SCAG, State
Continue to support, through Compass Blueprint, local jurisdictions and sub-regional COGs adopting neighborhood-oriented development, suburban villages, and revitalized main streets as livability strategies in areas not served by high-quality transit.	SCAG, State, Local Jurisdictions, COGs
Encourage the use of range-limited battery electric and other alternative fueled vehicles through policies and programs, such as, but not limited to, neighborhood oriented development, complete streets, and Electric (and other alternative fuel) Vehicle Supply Equipment in public parking lots.	Local Jurisdictions, COGs, SCAG, CTCs
Continue to support, through Compass Blueprint, planning for new mobility modes such as range- limited Neighborhood Electric Vehicles (NEVs) and other alternative fueled vehicles.	SCAG, State
Collaborate with the region’s public health professionals to enhance how SCAG addresses public health issues in its regional planning, programming, and project development activities.	SCAG, State, Local Jurisdictions
Support projects, programs, and policies that support active and healthy community environments that encourage safe walking, bicycling, and physical activity by children, including, but not limited to development of complete streets, school siting policies, joint use agreements, and bicycle and pedestrian safety education.	Local Jurisdictions, SCAG
Seek partnerships with state, regional, and local agencies to acquire funding sources for innovative planning projects.	Local Jurisdictions, SCAG, State
Update local zoning codes, General Plans, and other regulatory policies to accelerate adoption of land use strategies included in the 2012–2035 RTP/SCS Plan Alternative, or that have been formally adopted by any sub-regional COG that is consistent with regional goals.	Local Jurisdictions
Update local zoning codes, General Plans, and other regulatory policies to promote a more balanced mix of residential, commercial, industrial, recreational and institutional uses located to provide options and to contribute to the resiliency and vitality of neighborhoods and districts.	Local Jurisdictions
Support projects, programs, policies and regulations that encourage the development of complete communities, which includes a diversity of housing choices and educational opportunities, jobs for a variety of skills and education, recreation and culture, and a full-range of shopping, entertainment and services all within a relatively short distance.	Local Jurisdictions, SCAG
Pursue joint development opportunities to encourage the development of housing and mixed-use projects around existing and planned rail stations or along high-frequency bus corridors, in transit-oriented development areas, and in neighborhood-serving commercial areas.	Local Jurisdictions, CTCs
Working with local jurisdictions, identify resources that can be used for employing strategies to maintain and assist in the development of affordable housing.	SCAG, Local Jurisdictions
Consider developing healthy community or active design guidelines that promote physical activity and improved health.	Local Jurisdictions
Support projects, programs, policies, and regulations to protect resources areas, such as natural habitats and farmland, from future development.	Local Jurisdictions, SCAG
Create incentives for local jurisdictions and agencies that support land use policies and housing options that achieve the goals of SB 375.	State, SCAG
Continue partnership with regional agencies to increase availability of state funding for integrated land use and transportation projects in the region.	State, SCAG
Engage in a strategic planning process to determine the critical components and implementation steps for identifying and addressing open space resources, including increasing and preserving park space, specifically in park-poor communities.	Local Jurisdictions, SCAG
Identify and map regional priority conservation areas for potential inclusion in future plans.	SCAG
Engage with various partners, including CTCs and local agencies, to determine priority conservation areas and develop an implementable plan.	SCAG, CTCs
Develop regional mitigation policies or approaches for the 2016 RTP.	SCAG, CTCs

The transportation network consists of public transit, highways, local streets, bikeways, and walkways. Creation of HQTAs, called for by the land use pattern, requires an expansion of the public transportation and transit service on new and existing routes to create greater accessibility and connectivity throughout the region. Measures to ensure the expansion of the transportation network supportive of the land use plan include adding new corridors and lengthening existing ones in Los Angeles County through Measure R, providing additional travel options for long distance travel within the region and neighboring regions, improving technology along existing highways and local streets, and increasing the active transportation network. The expansion of the transportation network will include highways, local arterials, bus transit, active transportation, light rail transit, high-speed and passenger rail, and transit facilities.

Even with the focus of transportation currently on the reduction of single-occupancy vehicle trips, the addition of highways and arterials will still need improvements. There are critical gaps which hinder access to isolated parts of the region and cause congestion chokepoints elsewhere in the network. Transit facilities and services will also be expanded over the next 25 years. The envisioned rail network will add entirely new corridors and lengthen existing corridors, as well as supplement and host new bus rapid transit (BRT) routes and Metro link lines. The expansion includes frequency, encouraging targeted corridors and larger spans of service in TOD and HQTA areas.

Active transportation networks are an essential part of the regional transportation system and will see some of the largest expansion of a transportation network in the region over the next 25 years. They are low cost, reduce roadway congestion, and increase health and quality of life. The RTP/SCS calls for an expansion of the public transportation network and transit services (i.e., public transit, highways, local streets, bikeways, and walkways) on new and existing routes to create greater accessibility and connectivity throughout the Los Angeles region. Active transportation will receive a total of \$6.7 billion in available revenues - an increase of more than 200% over the 2008 RTP. Increasing the use of active modes of transportation will require bicycle and pedestrian facility maintenance, easy access to transit facilities, and safety improvements. Dedicated bicycle facilities require expansion in the region (7,154 miles planned), and established sidewalks will undergo streetscape improvements to improve pedestrian environments.

Table 4.4 Transportation Network Actions and Strategies

Proposed Action/Strategy	Responsible Party(ies)
Perform and support studies with the goal of identifying innovative transportation strategies that enhance mobility and air quality, and determine practical steps to pursue such strategies, while engaging local communities in planning efforts.	SCAG, CTCs
Cooperate with stakeholders, particularly county transportation commissions and Caltrans, to identify new funding sources and/or increased funding levels for the preservation and maintenance of the existing transportation network.	SCAG, CTCs, Local Jurisdictions
Expand the use of transit modes in our subregions such as BRT, rail, limited-stop service, and point-to-point express services utilizing the HOV and HOT lane networks.	SCAG, CTCs, Local Jurisdictions
Encourage transit providers to increase frequency and span of service in TOD/HQTA and along targeted corridors where cost-effective and where there is latent demand for transit usage.	SCAG, CTCs
Encourage regional and local transit providers to develop rail interface services at Metrolink, Amtrak, and high-speed rail stations.	SCAG, CTCs, Local Jurisdictions
Expand the Toolbox Tuesdays program to include bicycle safety design, pedestrian safety design, ADA design, training on how to use available resources that expand understanding of where collisions are happening, and information on available grant opportunities to improve bicycle and pedestrian safety.	SCAG, State
Prioritize transportation investments to support compact infill development that includes a mix of land uses, housing options, and open/park space, where appropriate, to maximize the benefits for existing communities, especially vulnerable populations, and to minimize any negative impacts.	SCAG, CTCs, Local Jurisdictions
Explore and implement innovative strategies and projects that enhance mobility and air quality, including those that increase the walkability of communities and accessibility to transit via non-auto modes, including walking, bicycling, and neighborhood electric vehicles (NEVs) or other alternative fueled vehicles.	SCAG, CTCs, Local Jurisdictions
Collaborate with local jurisdictions to plan and develop residential and employment development around current and planned transit stations and neighborhood commercial centers.	SCAG, CTCs, Local Jurisdictions
Collaborate with local jurisdictions to provide a network of local community circulators that serve new TOD, HQTAs, and neighborhood commercial centers providing an incentive for residents and employees to make trips on transit.	SCAG, CTCs, Local Jurisdictions
Similar to SCAG's partnership with the City of Los Angeles and LACMTA, offer to all County Transportation Commissions a mutually funded, joint first mile/last mile study for each region.	SCAG, CTCs
Develop first-mile/last-mile strategies on a local level to provide an incentive for making trips by transit, bicycling, walking, or neighborhood electric vehicle or other ZEV options.	CTCs, Local Jurisdictions
Encourage transit fare discounts and local vendor product and service discounts for residents and employees of TOD/HQTAs or for a jurisdiction's local residents in general who have fare media.	Local Jurisdictions
Work with transit properties and local jurisdictions to identify and remove barriers to maintaining on-time performance.	SCAG, CTCs, Local Jurisdictions
Develop policies and prioritize funding for strategies and projects that enhance mobility and air quality.	State
Work with the California High-Speed Rail Authority and local jurisdictions to plan and develop optimal levels of retail, residential, and employment development that fully take advantage of new travel markets and rail travelers.	State
Work with state lenders to provide funding for increased transit service in TOD/HQTA in support of reaching SB 375 goals.	SCAG, State
Continue to work with neighboring Metropolitan Planning Organizations to provide alternative modes for interregional travel, including Amtrak and other passenger rail services and an enhanced bikeway network, such as on river trails.	SCAG, State
Encourage the development of new, short haul, cost-effective transit services such as DASH and demand responsive transit (DRT) in order to both serve and encourage development of compact neighborhood centers.	CTCs, Municipal Transit Operators
Work with the state legislature to seek funding for Complete Streets planning and implementation in support of reaching SB 375 goals.	SCAG, State
Continue to support the California Interregional Blueprint as a plan that links statewide transportation goals and regional transportation and land use goals to produce a unified transportation strategy.	SCAG, State

Transportation Demand Management (TDM) Strategies are key to any transportation network and provide the approach and policies necessary to reduce and redistribute travel demand, specifically of single-occupancy vehicles, spatially and temporally. Extensive TDM strategies that support the expected land use development patterns will increase the usability and effectiveness of the active transportation system. TDM strategies will receive a total of \$4.5 billion in available revenues - an increase of more than 200% over the 2008 RTP - in order to close gaps in the regional bikeway network, bring the majority of the sidewalks and intersections in the region into American with Disabilities Act (ADA) compliance, expand parking cash-out programs in urban areas, and promote Guaranteed Ride Home programs. Employment of strategies, such as incentives to reduce solo driving, which increase the usability and effectiveness of the active transportation system and first-last mile amenities will allow travelers to easily connect to transit service at their origins and destinations. TDM funding can be used to develop mobility hubs around major transit stations, integrate bicycle and transit by providing bicycle racks on buses, and provide dedicated bicycle racks on light and heavy rail vehicles.

Safety is a main priority for transportation demand management in active transportation networks with cyclists; cyclists range from “vehicular cyclists” that are fully confident on most surfaces and in traffic flows to “no way, no how” cyclists that are not interested in bicycling for transportation and may not ride at all. This broad range of rider types makes filling in the bikeway network gaps very important to ensure all levels of cyclists can safely and comfortably navigate to and from their destinations.

Table 4.5 Transportation Demand Management (TDM) Actions and Strategies

Proposed Action/Strategy	Responsible Party(ies)
Examine major projects and strategies that reduce congestion and emissions and optimize the productivity and overall performance of the transportation system.	SCAG
Develop comprehensive regional active transportation network along with supportive tools and resources that can help jurisdictions plan and prioritize new active transportation projects in their cities.	SCAG, CTCs, Local Jurisdictions
Encourage the implementation of a Complete Streets policy that meets the needs of all users of the streets, roads and highways – including bicyclists, children, persons with disabilities, motorists, neighborhood electric vehicle (NEVs) users, movers of commercial goods, pedestrians, users of public transportation and seniors – for safe and convenient travel in a manner that is suitable to the suburban and urban contexts within the region.	Local Jurisdictions, COGs, SCAG, CTCs
Support work-based programs that encourage emission reduction strategies and incentivize active transportation commuting or ride-share modes.	SCAG, Local Jurisdictions
Develop infrastructure plans and educational programs to promote active transportation options and other alternative fueled vehicles, such as neighborhood electric vehicles (NEVs), and consider collaboration with local public health departments, walking/biking coalitions, and/or Safe Routes to School initiatives, which may already have components of such educational programs in place.	Local Jurisdictions
Encourage the development of telecommuting programs by employers through review and revision of policies that may discourage alternative work options.	Local Jurisdictions, CTCs
Emphasize active transportation and alternative fueled vehicle projects as part of complying with the Complete Streets Act (AB 1358).	State, SCAG, Local Jurisdictions

Transportation System Management (TSM) measures maximize the efficiency of the transportation network and support the land use patterns of the RTP/SCS by increasing capacity and improving operation efficiency of the transit network with strategies such as universal transit fare cards, traffic signal synchronization, transit automatic vehicle locations (AVL), and advanced traveler information. System accessibility and safety are addressed by TSM measures as are traffic flow and air quality. The primary measures for TSM in the SCS are enhancing incident management, advanced ramp metering, corridor system management plans, traffic signal synchronization, and improved data collection. Making these improvements will contribute to improved traffic flow, better air quality, and system accessibility and safety.

Maximizing the existing transportation system reduces the need for costly system expansions while alleviating congestion and reducing accidents. TSM will be key in the economic vitality of the region, as it plays an increasing larger role in the movement of goods throughout the region. System efficiency at the ports and intermodal operations will reduce delays and wait times, assisting in meeting the larger goals of emission reduction. TSM measures also serve the public, providing real-time traffic conditions and alternative routes or transportation options. The measures are not only focused on auto-centric technology, but improvement of efficiency at transit user interfaces, such as purchasing transit tickets.

Comprehensive user statistics, demographics, bicycle travel patterns, accident mapping, and project funding needs are types of ongoing data collection that will be needed to help plan for increases in active transportation investments. All transportation planning projects will need to consider an increase in bicycle and pedestrian accommodations, multi-modal planning, programming, and design. The accommodation by all transportation planning efforts should, in effect, increase active transportation use and safety while accomplishing the environmental and congestion reduction goals that concern the entire region.

Table 4.6 Transportation System Management (TSM) Actions and Strategies

Proposed Action/Strategy	Responsible Party(ies)
Work with relevant state and local transportation authorities to increase the efficiency of the existing transportation system	SCAG, Local Jurisdictions, State
Collaborate with local jurisdictions and subregional COGs to develop regional policies regarding TSM	SCAG, COGs, Local Jurisdictions
Contribute to and utilize regional data sources to ensure efficient integration of the transportation system.	SCAG, CTCs
Provide training opportunities for local jurisdictions on TSM strategies, such as Intelligent Transportation Systems (ITS).	SCAG, Local Jurisdictions
Collaborate with local jurisdictions and subregional COGs to continually update the ITS inventory.	SCAG, COGS, Local Jurisdictions
Collaborate with CTCs to regularly update the county and regional ITS architecture.	SCAG, CTCs, Local Jurisdictions
Collaborate with the state and federal Government and subregional COGs to examine potential innovative TDM/TSM strategies.	SCAG, State, COGs

For the first time, SCAG has integrated land use, housing and environmental strategies with transportation planning to help meet emissions reduction targets by the California Air Resources Board. This Sustainable Communities Strategy provides an alternative to “business as usual” development. It encourages community revitalization and neighborhoods that are bike and pedestrian friendly, with convenient access to transit.

SCAG (09/20/2012)

The dominant factors that will continue to affect travel behavior, contribute to transit demand, and determine access patterns over the next 30 years, are demographic changes and population growth. The SCS objectives and strategies are a framework for reducing travel distances and providing additional travel choices while addressing these regional challenges and their impact on air pollution and human health. The four building blocks of SCS; land use, transportation networks, transportation demand management strategies, and transportation system management, identify an explicit link between land use policy and transportation investments. Many see the link between land use and transportation planning as the largest breakthrough of the 2012 RTP/SCS; it is very possible that making the link between transportation and health is an even more significant breakthrough.

The ongoing partnership between SCAG and Metro covers a range of initiatives that address these linkages. While the land use pattern provides the region with housing options near transit, the expansion of the network consists of many investments in alternative infrastructure to further the reach of transit. These investments provide the framework for alternatives such as green technology (car charging stations), telecommuting, interconnected active transportation networks, adequate parking, and improvements to roads in poor condition and non ADA compliant sidewalks. The 2012 RTP/SCS’s focus on connectivity at all scales is paramount in reaching the goals for sustainability and public health, by decreasing GHG emissions, shortening commute times (associated with poor health) and promoting physical activity as a commute mode by providing safer streets in and around transit zones and communities.

Active transportation, while only one piece of the multi-modal network, will play a key role in the expanded transportation network, particularly the land use pattern. A First Last Mile Strategy should consider expanding the definition of POTs beyond “pedestrians” to include all forms of non-motorized mobility devices that support active living as well as clean energy (i.e., electric) mobility devices. It is worth noting that First Last Mile planning is concerned primarily with mobility in the public realm, most importantly the linkages between origins and destinations that rely on public transportation network infrastructure (rails, roads, walkways, etc.), and as such, is concerned with the connections to and from various land uses, not the visioning of land uses themselves.

SCAG’s 2012-2035 RTP/SCS is a policy document that outlines strategies for reaching the region’s GHG emission reduction and healthy sustainable community goals. It is a driving document that provides background demographic data for the region along with future growth analysis and vision. Metro’s Joint-Work Program with SCAG is a collaboration that includes the RTP/SCS and ensures its progress into the 2016 RTP/SCS, advancing sustainable transportation options through its countrywide planning capacity and programming transportation funds in the region. The RTP/SCS acts as a key component to the technical analysis supporting the First Last Mile Strategic Plan and provides a framework for active transportation recommendations and first last mile solutions.

Countywide Sustainability Planning Policy (CSPP)

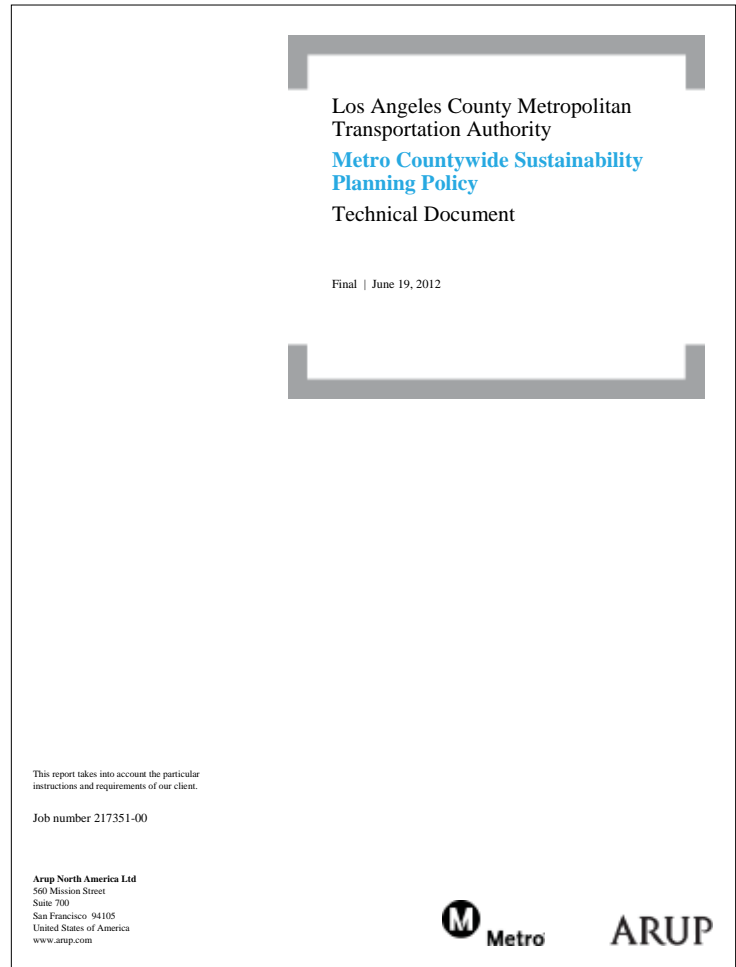
June 2012

This document was prepared by Los Angeles County Metropolitan Transportation Authority (Metro) for the citizens of Los Angeles County.

The Countywide Sustainable Planning Policy (CSPP) uses SCAG's Regional Transportation Plan (RTP)/ Sustainable Community Strategy (SCS) 2012 as its foundation to create a more sustainable and active transportation system. Compliance with state climate change law is also promoted to implement the regionally adopted land use and transportation vision. The Countywide Sustainable Planning approach integrates land use and transportation design such as pedestrian-oriented transit zones (POTs), transit-oriented developments (TODs), and complete-streets that incorporates local modes of access and promotes "green mode" (walking, biking, rideshare, transit, and clean-fueled vehicles) trips. Complete streets and transit-oriented development policies are consistent with the RTP/SCS and should be promoted at the local level through policy incentive programs.

The CSPP applies place-based policies to activity clusters in order to delineate appropriate active transportation strategies based on existing densities, activity levels, and zoning typologies:

- **Cluster A** includes areas with moderate to high residential density, but limited access to major job centers and long commutes to work. Cluster A should have access to alternative commuting options such as rail and buses active transportation options are limited due to nearby auto-oriented corridors and suburban block patterns. Policies applicable to Cluster A support the growing use of active transportation through facilities development and promotion of safety. Transit-oriented development should be planned at select locations with a focus on mixed-use centers, and transit services to employment centers, corridors, and feeder services should be provided. Projects that utilize existing capacity of streets by all modes should be prioritized.
- **Cluster B** includes two sub-types, both with low housing densities, of suburban/rural communities and special-use areas such as large industrial zones. Cluster B requires diverse transportation strategies for residents, workers, and goods. Because auto-oriented travel is typically the most efficient in suburban and rural communities the advancement and development of new policies that promote efficiency in alternative transportation modes and trip reduction is needed to improve health and mobility in these community types. In special-use areas the addition of transportation alternatives for commuters is important for job access as well as the efficient operation of major freeway



and freight corridors.

Cluster B policies encourage active transportation networks, but the local government planning policies are focused on improving the efficiency and safety of goods movement along with passenger travel. Cluster B place types' transit services focus on creating sub-regional transit hubs and feeder services. Special-use areas support sustainable transportation through the promotion of clean-fuel vehicles and other green transit modes. Where greater development is desired strategies that limit congestion should be considered.

- **Cluster C** defines sub-regional centers, neighborhoods, and districts where housing is dense enough to support local employment centers. Short trip lengths allow for active modes and transit to serve as the primary commute methods.

- **Cluster D** covers areas with significant urban office centers, major destinations, and cultural activity. These areas are mixed-use horizontally and vertically and have high capacity transit stops and corridors throughout. They allow for multimodal connectivity at the local, regional, and statewide scale. Clusters C and D are the place types that best suit mobility options that support car-free and one-car living through extensive pedestrian, bicycle, and transit facilities. Mixed use corridors with local transit coverage and prioritization of active modes of transportation are encouraged.

The four place-based topics - sustainable transportation, local government planning, transit services, and street operations - are used as general guides for policy making, but each activity cluster has a set of specific policies within these guides that best addresses their transportation needs.

Accessibility is analyzed through the Policy's Accessibility Index which includes nine place types that are combined into the four place type clusters. The Index is a secondary characterization that assigns context to current planning and investment projects where they correspond with existing Measure R project implementation. The Index clusters, categorized as capacity enhancements, interchanges, ramps and grade separations, provide a method for understanding Measure R projects.

The Countywide Sustainability Planning Policy is a policy document that lays out specific objectives and strategies to expand the transportation system and focuses on accessibility throughout the region. The identification of place types, and typically which new infrastructure is applied to each place type to improve accessibility, is a jumping off point for defining transit zones and expanding station areas in the First Last Mile Strategic Plan.

Metro's Long Range Transportation Plan (LRTP)

August 2009

This document was prepared by the Los Angeles County Metropolitan Transportation Authority (Metro) for the citizens of Los Angeles County.

Metro's Long Range Transportation Plan aims to improve mobility over the next thirty years by enhancing public transit and reducing greenhouse gas emissions by funding expansion to public transit throughout the region. The LRTP will play a key role in implementing the 2006 Bicycle Transportation Strategic Plan (BTSP), and is focused on improving bicycle and pedestrian access to encourage ridership of new and existing transit. It acknowledges that coordination between transit and users' final destinations, including linkages to bus centers and rail stations, is vital to sustainability of the regional transportation system.

Along with the BTSP, this plan will improve bicycling as a viable transportation mode by shifting the focus from long arterial bikeways to routes under three miles and improving access to bike-transit hubs. Filling gaps in the bikeway system and improving parking at transit stations are essential to encourage the use of bicycles with transit. In addition to bicycling, pedestrian improvements are a priority in the non-motorized component of the transportation network. All motorized and non-motorized modes of transportation should connect to an efficient and safe pedestrian system at the beginning and end of trips, as well as secondary destinations and links into the public transit systems. Improvements to wayfinding, signage, sidewalks, and street crossings should be made alongside installation of physically attractive features and amenities. Metro's approach to improving the pedestrian environment focuses on the development of public policy, adoptions of regulatory standards, and targeted funding.



Short Range Transportation Plan (SRTP)

2003

This document was prepared by Los Angeles County Metropolitan Transportation Authority (Metro) with Mobility 21 Coalition for the citizens of Los Angeles County.

The Short Range Transportation Plan is a master plan to protect funding sources for Los Angeles County's transportation needs and assess options for additional and future funding. Metro will work with subregional organizations to fund and implement priority projects that improve local bus services, expand the Metro Rapid Bus program, expand the light rail system, and introduce Metro Rapid Transitways to create better connectivity throughout the County.

The Mobility 21 Coalition, a contributor to this document, incentivizes better land use and transportation planning interaction and the Short Range Transportation Plan's land use initiative to grow more efficiently. Enhancing non-motorized forms of transportation that provide compliments to transit use supports the land use initiative, as well as the Congestion Management Program (CMP).

The land use initiative encourages infill development near transit stations and along major transit corridors, and promotes land use programs that create self-sustaining urban centers. Minimizing the need for intraregional car travel and increasing the use of active transportation, the plan explores opportunities to construct transit-oriented developments. Initiatives such as creating smart growth enterprise zones, market-based incentives, and traffic impact fees will ensure the impact of growth on the regional transportation network is better addressed. The Land Use Initiative Action Plan calls for coordination between the partnership programs with SCAG's growth visioning process. The bicycle and pedestrian programs are expected to be implemented in the short-term to enhance non-motorized forms of transportation. Creating environments that are comfortable and safe will encourage pedestrians to walk longer distances or take public transportation in exchange for short auto-trips. The SRTP Bicycle and Pedestrian Program Action Plan calls for implementation of programs that complete gaps in countywide networks, encourage access to transit services, and improve mobility and safety. The Action Plan also promotes programs that enhance pedestrian travel, such as expansion of the transit system and redevelopment of urban centers around transit. (Insert SRTP Table of Improvements)



Bicycle Transportation Strategic Plan (BTS)

June 2006

This document was prepared by the Los Angeles County Metropolitan Transportation Authority with Alta Planning + Design, Inc., Transight Limited, and Leslie Scott Consulting for use by the Cities of Los Angeles County.



The Bicycle Transportation Strategic Plan is collaborative document utilizing the Metro Bicycle Transportation Strategic Plan and the Bicycle Transportation Account Compliance Document, both prepared to improve mobility in the region through the use of bicycles. The BTS establishes regional planning policy and tools for local agencies promoting bicycling as a viable transportation mode. The purpose of the BTS is to identify strategies that increase the use of bicycles in place of automobiles for trips to work, errands, recreational destination, and transit. The BTS includes a policy objective to encourage high quality end-of-trip facilities at transit locations and destinations. The countywide incorporation of bicycle parking will help create a network of bike-transit centers, and more seamless linkages for users from their origin to their destination. The bikes-to-transit policy objective encourages transit hub access plans to ensure that bicycle access is addressed in the design of new and existing transit stations.

Creating Successful Transit-Oriented Districts in Los Angeles: A Citywide Toolkit for Achieving Regional Goals

February 2010

This document was prepared by The Center for Transit-Oriented Development (CTOD) for Caltrans and the Los Angeles County Metropolitan Transportation Authority (Metro).

The Center for Transit-Oriented Development identifies strategies that could help station areas achieve high transit ridership, lower VMT, provide housing, create healthy neighborhoods, and provide a multitude of travel options. This TOD study explores the opportunities and challenges of achieving TODs in Los Angeles County. One of the study's strategies for expanding TOD in Los Angeles is supporting the SCS and its implementation of SB 375, which will require a significant change in density and development where transit station areas will be designated as regional priority areas for growth. The study breaks down benefits of TOD into four categories: public health, economic development, affordable housing, and climate change; and assesses each strategy's impact on those benefits. While many strategies address individual benefits offering high quality transit options, increasing housing near transit, improving walkability, and enhancing access between transit and job centers all positively impact at least three of the four strategies. The CTOD's report supports the sentiment that coordination and linkages between transit hubs and destinations are vital to a sustainable transit network throughout the region. The CTOD studied 71 existing and under-construction transit stations in Los Angeles and categorized them into nine station area place types based on existing intensity of each station area and the proportion of residents to employees. The "station area typologies" are categorized as residential, balanced, and employment; and are ranked from lowest to highest VMT to determine appropriate strategies that create high-performing TOD projects.

Creating Successful Transit-Oriented Districts in Los Angeles: A Citywide Toolkit for Achieving Regional Goals

Executive Summary

February 2010



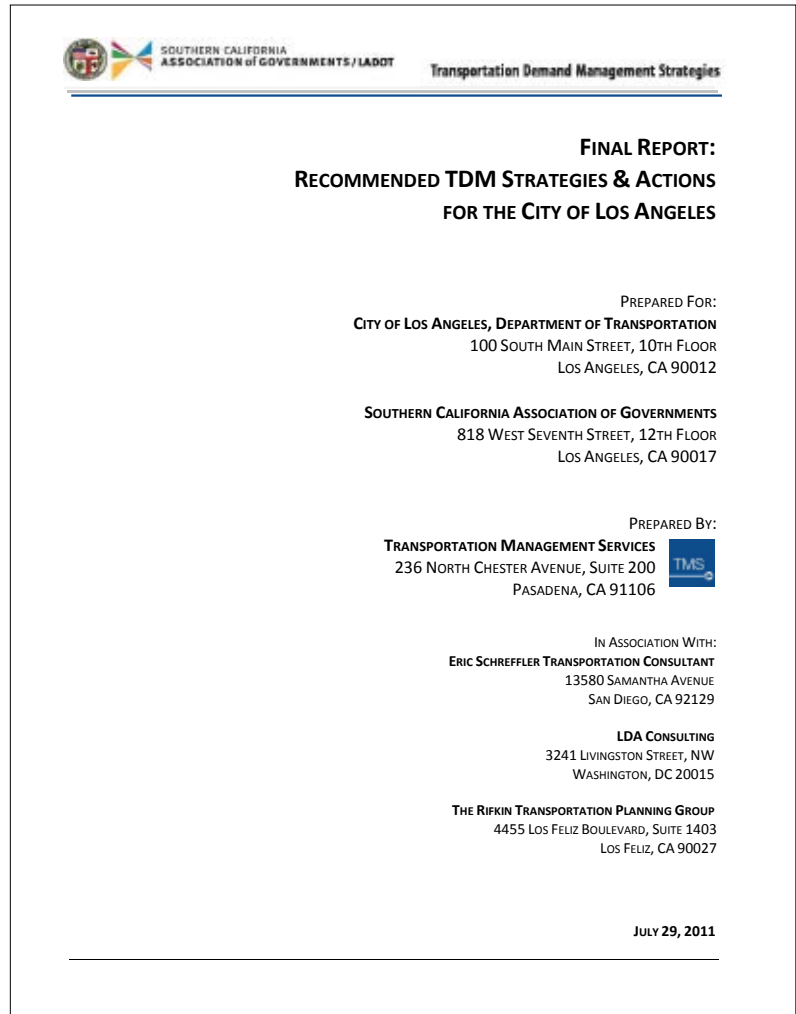
Transportation Demand Management Strategies Report (TDMS)

July 2011

This document was prepared by Transportation Management Services (TMS) with Eric Schreffler Transportation Consultants, LDA Consulting, and The Rifkin Transportation Planning Group for the City of Los Angeles Department of Transportation and the Southern California Association of Governments (SCAG).

The Transportation Demand Management Strategies report summarizes a study to identify actions the City should consider maintaining, enhancing, and/or adopting to reduce the demand for automobile traffic.

This TDMS report recognizes how strategies can balance demand for travel by supplying transportation facilities and re-configure an auto-dominated physical environment to promote connectivity. The report ranks existing strategies/actions used to promote transit ridership, giving high rankings to strategies that promote access and ease of transition at transit facilities. Giving higher priority to TDM in LADOT Traffic Study Policies and multi-modal measurements is ranked in the high category as well. Along with positive reinforcement for non-vehicular modes of transportation, such as filling gaps in bicycle networks and creating safer pedestrian walkways, the TDMS has recommendations for decreasing the ease of access for automobiles in transit-oriented developments, such as increased density with decreased parking requirements. While TDM initiatives are pursued by City departments independently, this report offers tools for coordination with multiple departments which will be beneficial for funding larger projects and providing greater improvements.



Metro Eastside Access Project

June 2011

This document was prepared by the Los Angeles County Metropolitan Transportation Authority (Metro) with the Community Advisory Committee for residents on the Eastside of Los Angeles County.

In 2009, the Metro Eastside Access Project identified ways to improve access and safety while reflecting local communities surrounding stations on the Gold Line Eastside expansion. The priorities focused on creative landscape solutions, public art, and lighting and signage on City-owned streets and sidewalks. The street improvements in the Metro Eastside Access Project provide additional benefits to pedestrians' and bikers' experiences. Land use and transportation integration planning is not a component of the project; however, the recommendations identify existing urban centers and work to create linkages between them and transit.

These linkages include enhanced wayfinding, pedestrian connections through public plazas, and bicycle improvements such as bike lanes and sharrows. (Insert Eastside Access Project Boards or just the tables from the boards)

Metro Gold Line Eastside Access Project

1st & Cummings Plazas

Before

After

Goal: Connect two key Boyle Heights stations and the 1st Street commercial district currently separated by the I-5/I-10 freeway underpass and transform into an amenity and asset for Boyle Heights.

How to Accomplish

- Extend curbs and sidewalk to make pedestrian crossing distances shorter
- Dual curb ramps and enhanced crosswalks
- Encroach on Caltrans ROW to create small plazas
- Add hearty landscape to increase greenery
- Provide seating and shade elements
- Integrate community design elements based on culture of Boyle Heights
- Maintain access for Caltrans

Metro

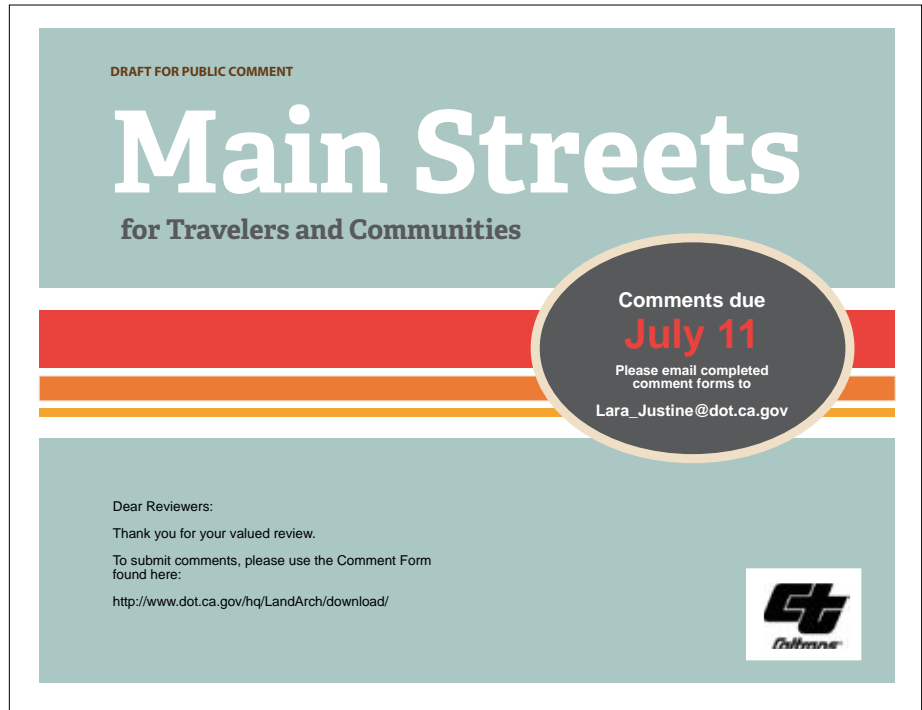
Main Streets for Travelers and Communities

2012

This document was prepared by Caltrans for the public.

Main Streets for Travelers and Communities addresses the overlap of main streets' roles as transportation facilities and public places, and how planning and design of main streets impacts travelers, communities, and the environment. Multimodal travel, livability, and sustainability

are key components to main street strategic planning. Design flexibility is a standard principle outlined by Caltrans allowing for design exceptions that take the context into consideration; however, Caltrans still calls for the evaluation of multi-mobility, livability, and sustainability before deviation from the design standards outlined in the Highway Design Manual when highways are functioning as main streets. Maximizing multimodal transportation networks is a main principle of Main Streets for Travelers and Communities. Emphasis on mobility, access, options, and connections (such as providing pedestrian access to transit stops) is a strategy for maintaining main streets that respond to the needs of local communities. Multimodal networks must address the users that participate in several modes of travel within a single trip (such as from a bus stop to a parked car) to fill the gaps in the transportation network. Caltrans recommends implementation of "complete streets" to incorporate multimodal principles into the physical configuration of roadways and facilities and best address the needs of travelers.



Metro Station Design Review

April 2012

This document was prepared by the design team of Johnson Fain, Sussman Prejza, Melendrez, and Lea+Elliot, for the Los Angeles County Metropolitan Transportation Authority (Metro).



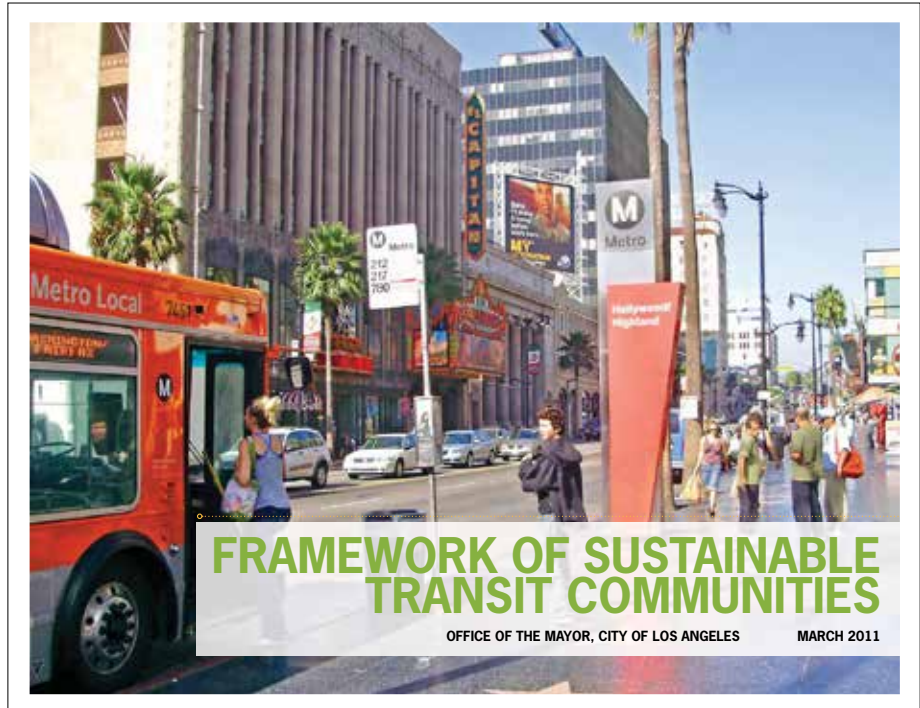
The Metro Station Design Review was commissioned to review the diversity of existing station designs and make recommendations to correct deficiencies and inconsistencies. The review contains recommendations for a “kit of parts” that can be applied to a variety of station area types and provide connectivity through visual identity. The main concerns for cohesive station design are legibility, maintainability, and flexibility. Cost effective strategies were given priority, but not where they hinder security, functionality, and accessibility of transit stations. Connectivity is a priority in station area design; the Metro Station Design Review promotes neighborhood linkages by establishing a minimum sphere of influence of improvements and station area branding; encouraging pedestrian circulation over vehicular traffic in transit zones by emphasizing physical pedestrian and bike connections; and utilizing signage to assure local destinations, bicycle infrastructure, and street names are clearly identified.

Compass Blueprint: Framework of Sustainable Transit Communities

March 2011

This document was prepared by a team of consultants: Design, Community & Environment (DC&E), Bay Area Economics (BAE), Arellano Associates, and

Christopher B. Leinberger, for the City of Los Angeles, with funding from the Southern California Association of Governments' (SCAG) Compass Blueprint Program and grants from the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), U.S. Department of Transportation (DOT).



This Compass Blueprint project provides a framework within which the City of Los Angeles and private developers can work for new construction and rehabilitation projects to create balanced Sustainable Transit Communities (STCs). STCs include a mix of housing and employment-generating uses such as offices and cleantech enterprises. This document identifies strategies for sustainable TOD near Metro rail and BRT stations and prioritizes investments. Using a scorecard developed for rating individual station areas, the study selected station areas with the highest potential to become STCs. The station areas were rated based on their existing qualities and availability of opportunity sites, as well as market conditions for creating job centers. When an STC has all of the qualities outlined in this framework it becomes a vibrant place with a strong local economy that encourages further investment in the station area. A major component of the framework is multimodal transportation systems; pedestrian friendly streets, walkability, connectivity, complete streets, and bicycle facilities are highly weighted qualities that impact other components of STCs as well.

The framework uses station place types (defined by the Center for Transit Oriented Development, CTOD), each with a distinct architectural character, mix of businesses and potential for economic success, and shared qualities that are used to inform efforts to transform them into Sustainable Transit Communities. For each of the nine place types defined by the CTOD - suburban neighborhood, neighborhood center, office/industrial district, transit neighborhood, mixed-use center, business district, urban neighborhood, urban center, and central business district/special district - components of the framework are given priority to best balance the given place types' intensity. This framework expands upon the CTOD's work by describing specific built character, mix of uses, and pedestrian and bicycle network improvements needed for each place type to move towards an STC standard. The Compass Blueprint is a model for integrating land use and transportation planning that has been incorporated in the 2012-2035 RTP/SCS and local partners.

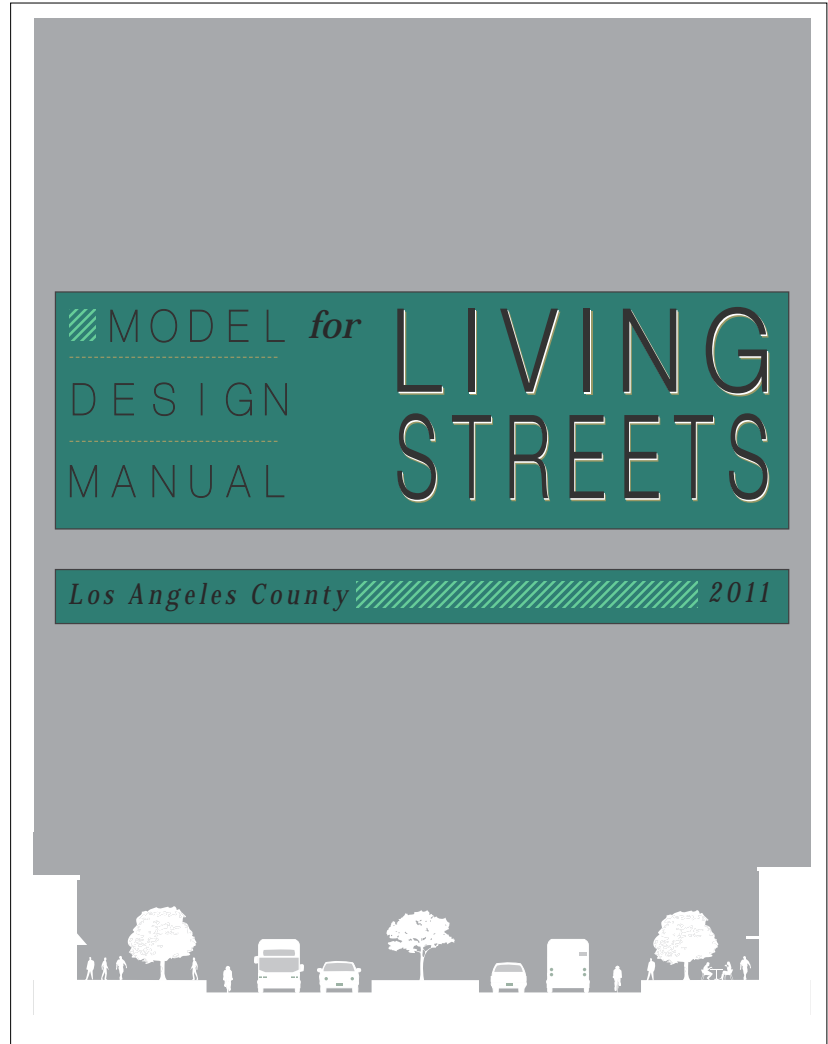
Los Angeles County Model Design Manual for Living Streets

October 2011

This document was prepared by the Los Angeles County Department of Public Health.

This document serves a manual for creating walkable and bicycle neighborhoods, cities that are conducive to transit use, and livable communities. Experts from traffic engineering, transportation planning, land use planning, architecture, landscape architecture, and public health teamed to produce this set of guidelines that create opportunities for active transportation networks and living streets. Living streets are designed for people of all ages and physical abilities whether they walk, bicycle, ride transit, or drive; and integrate connectivity and traffic calming with pedestrian-oriented site and building design to create safe environments. To assist in meeting the goals of living streets, this manual outlines benchmarks and performance measures for communities to adopt. The benchmarks ensure that every street and neighborhood is comfortable to walk and bicycle in, it is safe for children to use active transportation modes to get to school, all streets provide safe and comfortable crossings, active lifestyles are available to all, and traffic fatalities are reduced or eliminated. Performance measures are put in place to decrease fatalities and injuries in streets, increase active transportation trips and decrease motorized transportation trips, slow vehicle speeds on local streets, increase retail sales and tourism, and improve resident satisfaction in communities.

Sustainable street networks increase the number of people walking and bicycling and reduce vehicle miles traveled. To create a well designed street network the manual identifies seven zone types - natural, rural, sub-urban, general urban, urban center, urban core, and special district - and their associated street networks to assign design standards that will increase connectivity and improve street function. Within each zone type, improvements to intersections, pedestrian access and crossings, bikeway design, transit accommodations, traffic calming measures, streetscape design, and land use policy are identified to promote the engagement of communities along streets and in an active transportation network.



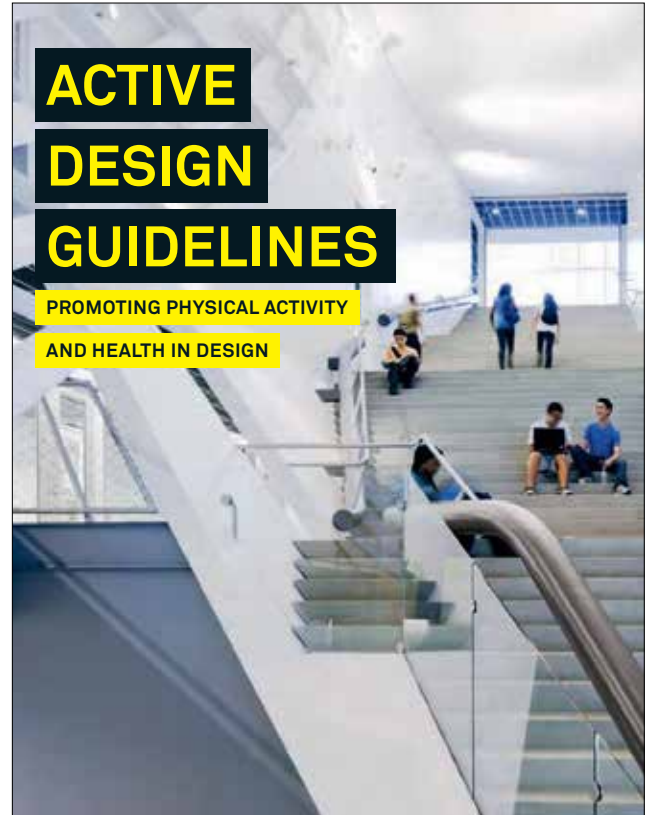
Active Design Guidelines: Promoting Physical Activity and Health in Design

October 2011

This document was prepared by New York City's Departments of Design and Construction (DDC), Health and Mental Hygiene, Transportation (DOT), and City Planning with the Mayor's Office of Management and Budget for designers, architects, and local agencies that play a role in the design and construction of the built environment.

The goal of the Active Design Guidelines is to create an environment that enables all city residents to incorporate healthy activity into their daily lives throughout New York City. The guidelines address neighborhoods, streets, and outdoor spaces that encourage active modes of transportation, including walking and bicycling. To create an active city access to transit and transit facilities, plazas, parks, open spaces, recreational facilities, and services needs to be improved through designing pedestrian friendly streets and bicycle facilities and expanding the active transportation network. The document outlines specific planning and design strategies that promote physical activity through recreation and active transportation. The "three Ds" that define the relationship between urban design and travel patterns: density, diversity, and design are supplemented by The Active Design Guidelines with destination accessibility and distance to transit to fill important gaps in the urban design process for active transportation networks. The strategies related to land use mix and transit address the design of the city's streets and public spaces in addition to strategies for enhancing the walkability and bicycle facilities on city streets. The strategies outlined in the Active Design Guidelines are based on current best practices and emerging ideas that will be tested and refined in the coming years. This document makes recommendations for land use, transit and parking, parks, open space and recreational facilities, public plazas, access to services, street connectivity, traffic calming, pedestrian pathways, programming streetscapes, bicycle networks and connectivity, bikeways, and bicycle infrastructure based on research that correlates the population's behavior with the built environment.

Strategies that increase physical activity by improving access to destinations such as parks and services from places of residence and work include: locating transit stops along well-connected streets and building entrances, providing a mix of land uses in walkable areas; designing facilities that make pedestrian and bicycle access to transit convenient; adding open spaces to large-scale developments; and encouraging the use of pathways, tracks, and open spaces through signage. Maintaining well connected streets with sidewalks that provide direct routes between destinations to increase pedestrianism should be combined with traffic calming strategies that promote walking by improving the pedestrian experience. Equally as important as providing pedestrian routes is creating attractive street environments that encourage walking with destinations such as art installations, outdoor cafes, and street closures for special programming. Bicycle networks and connectivity should be encouraged alongside pedestrian improvements by creating continuous networks



of bikeways, signage, and links between bicycling and transit. Addition of bicycle infrastructure such as parking, specific crossings, rails along outdoor stairways, and bike share programs can enhance the bikeway networks and provide more organized movements of pedestrians, cyclists, and motorists.

Walkable and Livable Communities Institute: Walkability Workbook

April 2012

This document was prepared by the Walkable and Livable Communities Institute for community walkability workshops by local agencies.

Walkability in communities promotes physical health, lowers traffic injury and death rates, and provides better access for people while reducing greenhouse gas emissions. This workbook provides principles of walkability that must be addressed to ensure accessible, welcoming, convenient, and safe pedestrian environments. Sidewalks, bike lanes, vehicle travel lanes, driveways, and parking can all be incorporated on streets with buffers of plantings, medians, striping, and sidewalks that make drivers, bicyclists, and pedestrians more comfortable traveling. Complete streets are designed and operated to enable safe access for pedestrians, bicyclists, motorists and transit riders. To accommodate a diversity of uses, sidewalks require space for street furniture, bike racks, trees, and room for building access that does not disrupt pedestrian flow. Proper bicycle facilities not only promote active transportation through bicycling, but improve pedestrian environments as well. When bicyclists are forced onto sidewalks due to lack of bike lanes, or lack of bike racks cause locking to signage and trees, they impede walkability. Through implementation of phased improvements over time, streets that are void of pedestrian safety and access can begin to promote walkability with sidewalks, crosswalks, parks, seating, signage, and orientation of new developments.

Active Living by Design (ALBD)

2010

Active Living by Design is a founding program in the Active Living initiative of the Robert Wood Johnson Foundation. It creates community-led change by working with local and national partners to build a culture of active living. <http://www.activelivingbydesign.org/events-resources/essentials/transportation>

Active Living by Design promotes physical activity by increasing transportation choices and expanding opportunities for active transportation. The organization looks at land use patterns and transportation infrastructure that can promote active transportation and increase health while reducing safety risks. A balance of transportation and land use goals can support walking, biking, transit, and alternative forms of travel to help make healthy lifestyles more attainable for communities. The Active Living by Design organization provides links to existing resources, guidelines, enhancement projects, and events that facilitate work on active living projects.

In Santa Ana, Sacramento, Oakland, and California, Active Living by Design has contributed to recreation opportunities by implementing physical improvement projects, establishing advisory groups and partnerships, and securing grants and funding for local projects. ALBD has identified five strategies as an approach to increasing physical activity in a community. Preparation, promotions, programs, policies, and physical projects each comprise specific tactics to create more active communities. They develop and maintain partnerships to conduct neighborhood assessments of barriers and opportunities, and evaluate master plans and ordinances that affect active living. After creating initiatives and programs for active living in community events and outreach, they establish policies that are consistent with land use and transportation plans that promote active living; update road policies, standards, and parking requirements; and secure funding for pedestrian and cycling-oriented capital improvements. ALBD works to successfully integrate physical infrastructure such as sidewalks, bike lanes, and trails with traffic calming measures to ensure safer and more comfortable walking and bicycling environments.



IBI Group
18401 Von Karman Avenue—Suite 110
Irvine CA 92612 USA

tel 949 833 5588
fax 949 833 5511

Memorandum

To/Attention	Sarah Jepson, LA Metro	Date	August 20, 2013
From	IBI Group	Project No	32903
cc	Neha Chawla	Steno	
Subject	Metro Path Initial Draft Cost Estimate for Three Selected Metro Rail Stations		

Introduction

The goal of this memo is to provide an overview of the high-level planning cost estimates prepared for proposed first-last mile improvements (Metro Path) at three case study sites within Metro Rail and BRT station areas. The three stations selected for analysis include Wilshire / Normandie (Metro Purple Line), 103rd / Watts (Metro Blue Line) and North Hollywood (Metro Red and Orange Lines). Network and design improvements follow guidelines set forth in the draft *Metro Path Planning Guidelines*.

Development of the Metro Path concept is an ongoing process. Path components currently proposed have been largely accounted for in this cost estimate, however added components and refinements that will take place as part of concept development are unaccounted for in this cost estimate at this time. This estimate begins to frame a baseline that can be refined in concert with concept development. Furthermore, when reviewed against projected ridership changes resulting from Metro Path improvements, future evaluation can be undertaken to review the effectiveness of the strategy from a *ridership/cost* perspective.

This Memo presents key findings from the analysis, the methodology used to develop cost estimates, a high-level cost estimate from each of the three stations (including a network map and cost summary tables for each), and source cost data used to generate quantity estimates. Contingencies have been applied to account for potential cost unknowns given the current level of design.

Key Findings

- Cost estimates assume that work is being done specifically to implement Path improvements. If improvements are made during normal street re-construction as part of routine roadway maintenance, cost savings could be achieved.
- Any improvement that involves curb and gutter re-configuration and re-construction is relatively expensive. Examples include bulb-outs at intersections and protected rolling lanes that utilize permanent curbs. These improvements can be achieved as short term low-cost improvements utilizing temporary barriers and street paint. These low-cost solutions have been accounted for in our low-cost estimate for each scenario.
- The low-cost variations suggest as much as 40% savings over more permanent options, but generally lack the same degree of permanence.
- Three sample sites are insufficient to generate a system-wide cost estimate with any form of accuracy. Important variables include level of intervention at different place-types, overlap (some facilities accounted for in one station area overlap with adjacent

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station areas), and economies of scale. The second two points noted suggest measurable reduction in costs if implementing along entire corridors or system-wide.

- The range of employment and residential centrality in the three case study sites reviewed suggest that higher densities equate to a denser network of improvements, but similar extension and length of Path Arterials.

Methodology

High level cost estimates for the Metro Path at the three stations were developed by multiplying bundled groups of improvements by either linear or quantity measures. Measurements and quantities were taken and aggregated working off Path network maps, and developed utilizing the methodology outlined in the *Metro Path Planning Guidelines*.

Groups of improvements were structured around intersections and street segments and included;

- **Type 1 Intersection** - Intersection improvements where Path Arterials cross other Path Arterials at or adjacent to subject station portals. Scramble intersections utilized.
- **Type 2 Intersection** – Intersections where Path Arterials cross Path Collectors.
- **Type 3 Intersection** – Intersections along Path Collectors (crossing other Collectors or non-Path network streets).
- **Mid-Block Crossings** – Can occur along any long block Path Arterial or Collector.
- **Type 1 Arterial** (250' segment) – Occurs within 1/2 mile of the station portal.
- **Type 2 Arterial** (250' segment) – Extends beyond 1/2 mile of the station portal some distance not to exceed 3 miles.
- **Collector** (250' segment) – Occurs within the one half mile of stations along identified routes.

The high level cost of each of the elements noted above was prepared by aggregating the various component costs that together formed the subject unit. Using the *Metro Path Planning Guidelines* as a reference, assumptions were made about what components would most likely be included in each element. The Metro Path has been planned as a flexible structure that can be applied in varying forms to respond to local conditions, funding availability and local inputs, therefore what is proposed here may in truth be affected by inputs not known at this time.

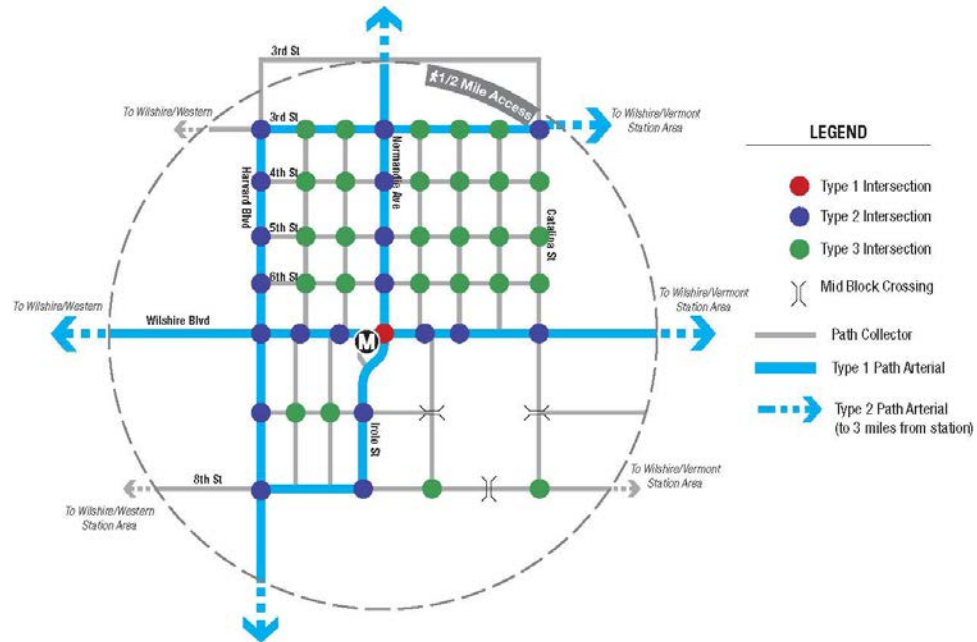
For each site, a high-cost and a low-cost estimate is provided ('Complete Path' and 'Path Lite' respectively). Differences between the two are attributed to the permanence of improvements (i.e. fixed bollards vs. paint buffers along Path Arterials) or the level of security and comfort of components (i.e. provision of in street LED flashers or street furniture). Items are tabulated for each site.

For each site, a network map is presented that visually highlights the different cost units noted above along with summary cost tables. Cost Assumptions follow these as back-up reference.

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Wilshire / Normandie Cost Estimate

WILSHIRE / NORMANDIE - PATH NETWORK MAP AND COST ESTIMATE



Complete Path Station Cost Table

Wilshire Normandie Station	Linear Feet	Qty.	Cost
Type I Arterial	17,817		\$ 2,904,071
Type II Arterial	24,035		\$ 2,631,833
Collector	28,089		\$ 1,315,380
Mid Block Crossing		5	\$ 962,140
Intersection Type I		1	\$ 218,342
Intersection Type II		20	\$ 4,366,850
Intersection Type III		27	\$ 145,200
Complete Path Station Total			\$ 12,543,816

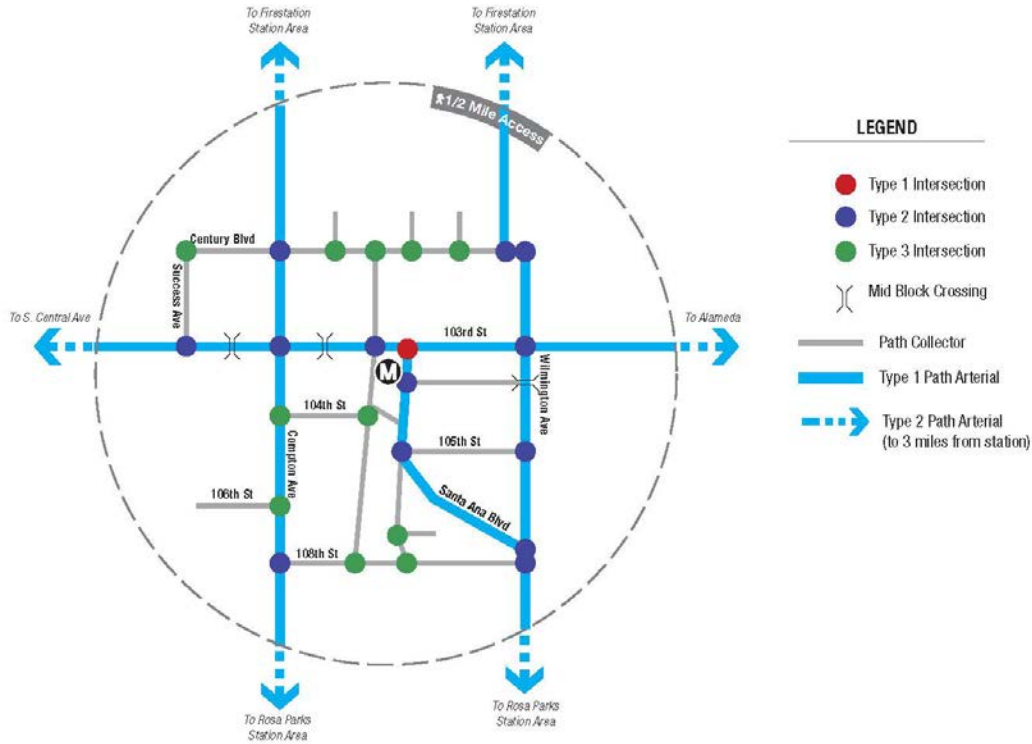
Path Lite Station Cost Table

Wilshire Normandie Station	Linear Feet	Qty.	Cost
Type I Arterial	17,817		\$ 2,110,680
Type II Arterial	24,035		\$ 1,228,890
Collector	28,089		\$ 1,315,380
Mid Block Crossing		5	\$ 743,140
Intersection Type I		1	\$ 24,128
Intersection Type II		20	\$ 386,050
Intersection Type III		27	\$ 145,200
Path Lite Station Total			\$ 5,953,468

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103rd / Watts Cost Estimate

103RD/WATTS - PATH NETWORK MAP AND COST ESTIMATE



Complete Path Station Cost Table

103rd/ Watts Station	Linear Feet	Qty.	Cost
Type I Arterial	17,140		\$ 2,793,724
Type II Arterial	32,727		\$ 3,583,607
Collector	13,006		\$ 609,058
Mid Block Crossing		3	\$ 577,284
Intersection Type I		1	\$ 240,848
Intersection Type II		13	\$ 2,838,452
Intersection Type III		13	\$ 69,911
Complete Path Station Total			\$ 10,712,884

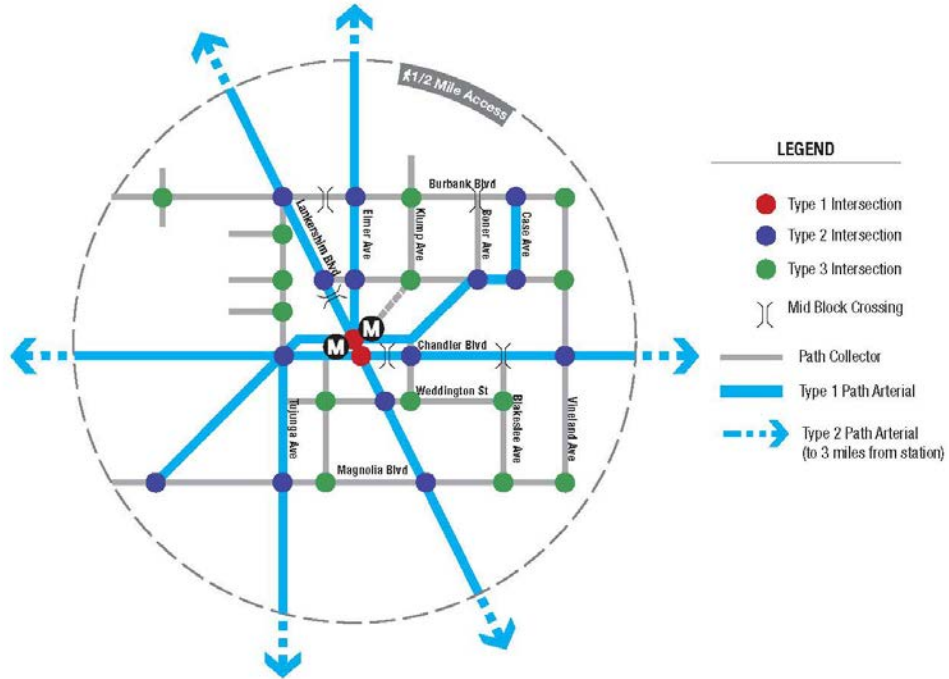
Path Lite Station Cost Table

103rd/ Watts Station	Linear Feet	Qty.	Cost
Type I Arterial	17,140		\$ 2,030,480
Type II Arterial	32,727		\$ 1,673,305
Collector	13,006		\$ 609,058
Mid Block Crossing		2	\$ 297,256
Intersection Type I		1	\$ 24,128
Intersection Type II		13	\$ 250,932
Intersection Type III		13	\$ 69,911
Path Lite Station Total			\$ 4,955,071

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North Hollywood Cost Estimate

NORTH HOLLYWOOD - PATH NETWORK MAP AND COST ESTIMATE



Complete Path Station Cost Table

North Hollywood Station	Linear Feet	Qty.	Cost
Type I Arterial	16,978		\$ 2,767,319
Type II Arterial	43,338		\$ 4,745,511
Collector	17,652		\$ 826,626
Mid Block Crossing		5	\$ 962,140
Intersection Type I		2	\$ 481,696
Intersection Type II		14	\$ 3,056,795
Intersection Type III		12	\$ 64,533
Complete Path Station Total			\$ 12,904,620

Path Lite Station Cost Table

North Hollywood Station	Linear Feet	Qty.	Cost
Type I Arterial	16,978		\$ 2,011,289
Type II Arterial	43,338		\$ 2,215,837
Collector	17,652		\$ 826,626
Mid Block Crossing		5	\$ 743,140
Intersection Type I		2	\$ 48,256
Intersection Type II		14	\$ 19,302
Intersection Type III		12	\$ 5,378
Path Lite Station Total			\$ 5,869,828

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Cost Assumptions

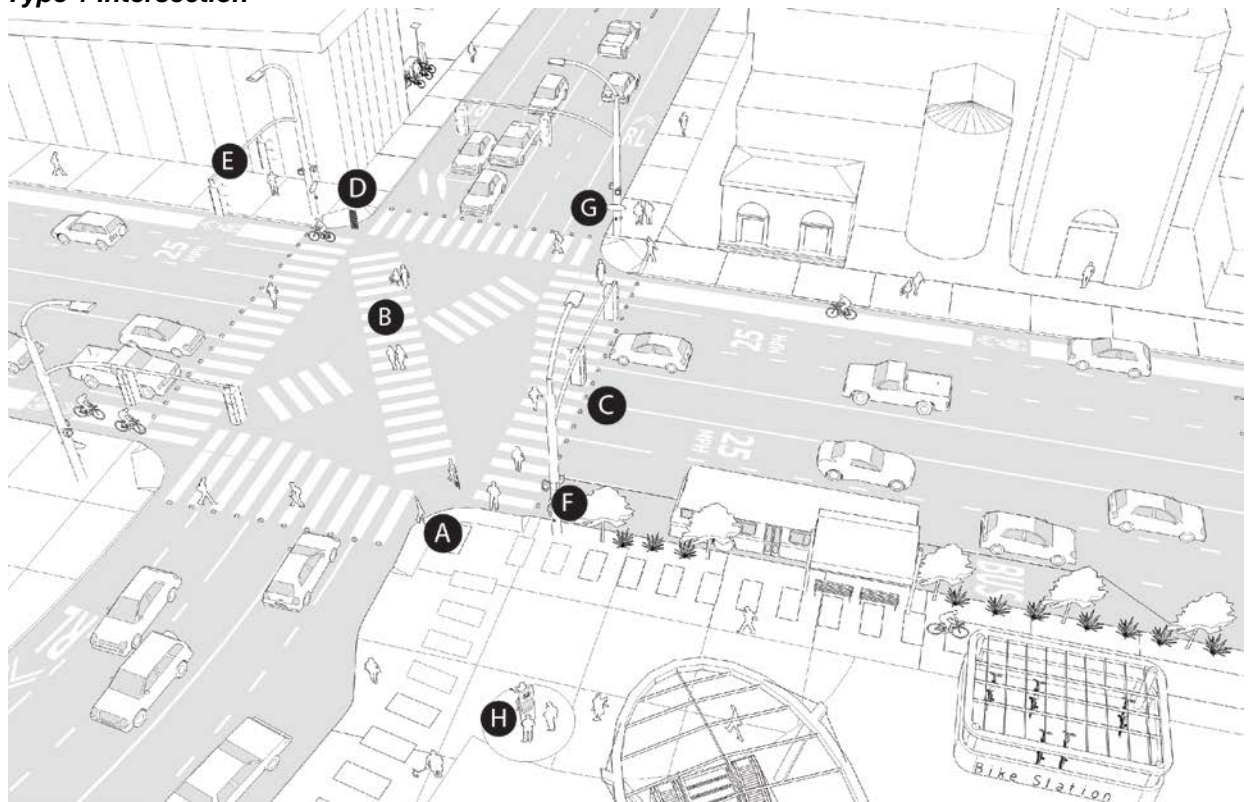
These cost estimates provided are based on previous public cost estimates for similar roadway and streetscape enhancements. This estimate is high level and includes the following assumptions in total costs of all components;

- **Contingency** - All cost estimates include a contingency for unforeseen incurred costs. This contingency is assumed to be 15% for planning purposes.
- **Engineering and Design** - 30% cost is included in each item for Engineering and Design of the elements; this covers additional design development and final design and engineering services.
- **Public Art** - A 1% cost is assumed for inclusion of art treatments that will increase aesthetics and enhance local community identity along the Path network.

As noted above in the Methodology section, improvements were bundled in the following units, source material is shown in the appendix;

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Type 1 Intersection

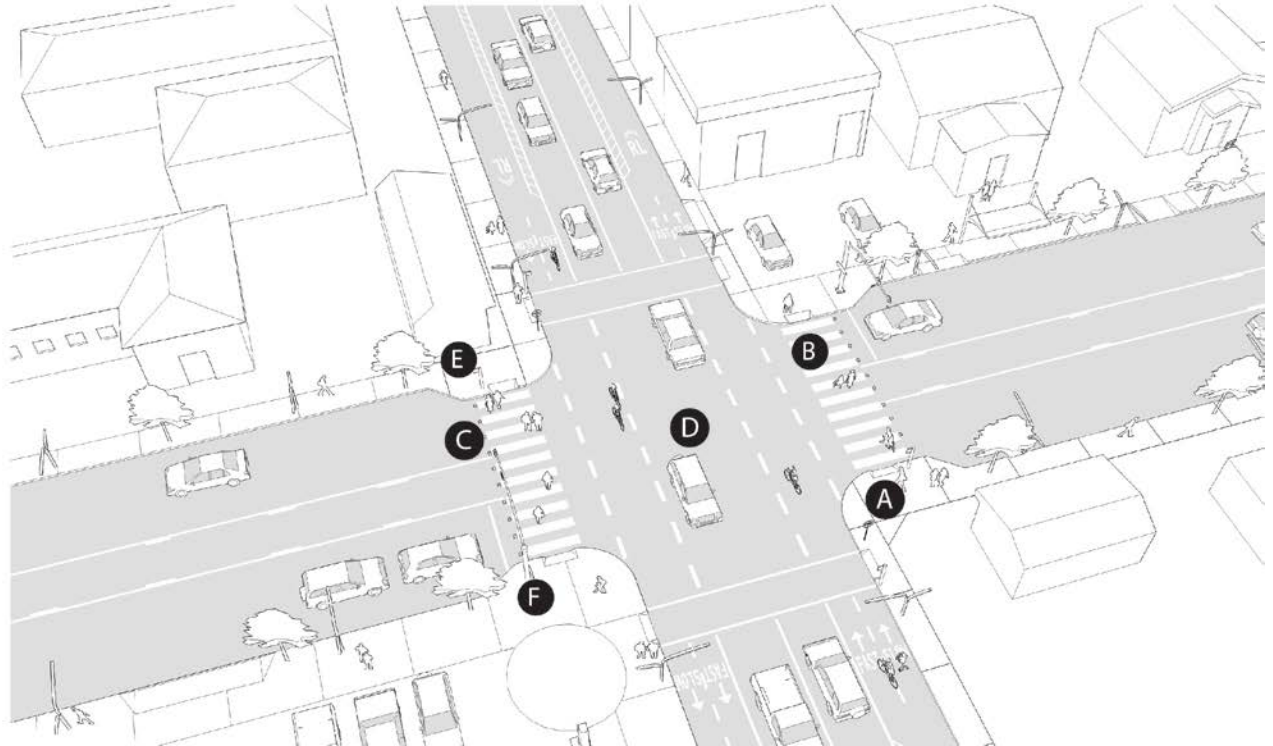


Legend	Complete Path Type I Intersection - Arterial&Arterial (Scramble)	Total Cost	Path Lite Type I Intersection - Arterial&Arterial (Scramble)	Total Cost	Source*
A	Bulbouts (Curb reconstruction, dual curb ramps)	\$ 146,000	Paint and Landscape Bulbouts	\$ 9,860	21
B	Crosswalks	\$ 3,728	Crosswalks	\$ 3,728	12
C	LED Flashers	\$ 24,480	LED Flashers (<i>Not Included in Path Lite</i>)	\$ -	13
D	Ped Detection padding	\$ 5,440	Ped Detection Padding (<i>Not Included in Path Lite</i>)	\$ -	17
E	Resignalize Signal for Pedestrians	\$ 40,800	Resignalize Signal for Pedestrians (<i>Not Included in Path Lite</i>)	\$ -	18
F	Ped buttons and Audio Chirp	\$ 14,144	Ped buttons and Audio Chirp	\$ 14,144	19
G	Medallion Signage	\$ 2,176	Medallion Signage	\$ 2,176	15
H	Information Kiosk (1 per Metro Stop)	\$ 4,080	Information Kiosk (1 per Metro Stop)	\$ 4,080	20
Total		\$ 240,848	Total	\$ 33,988	

*For Source information, Refer to Appendix A

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Type 2 & 3 Intersection



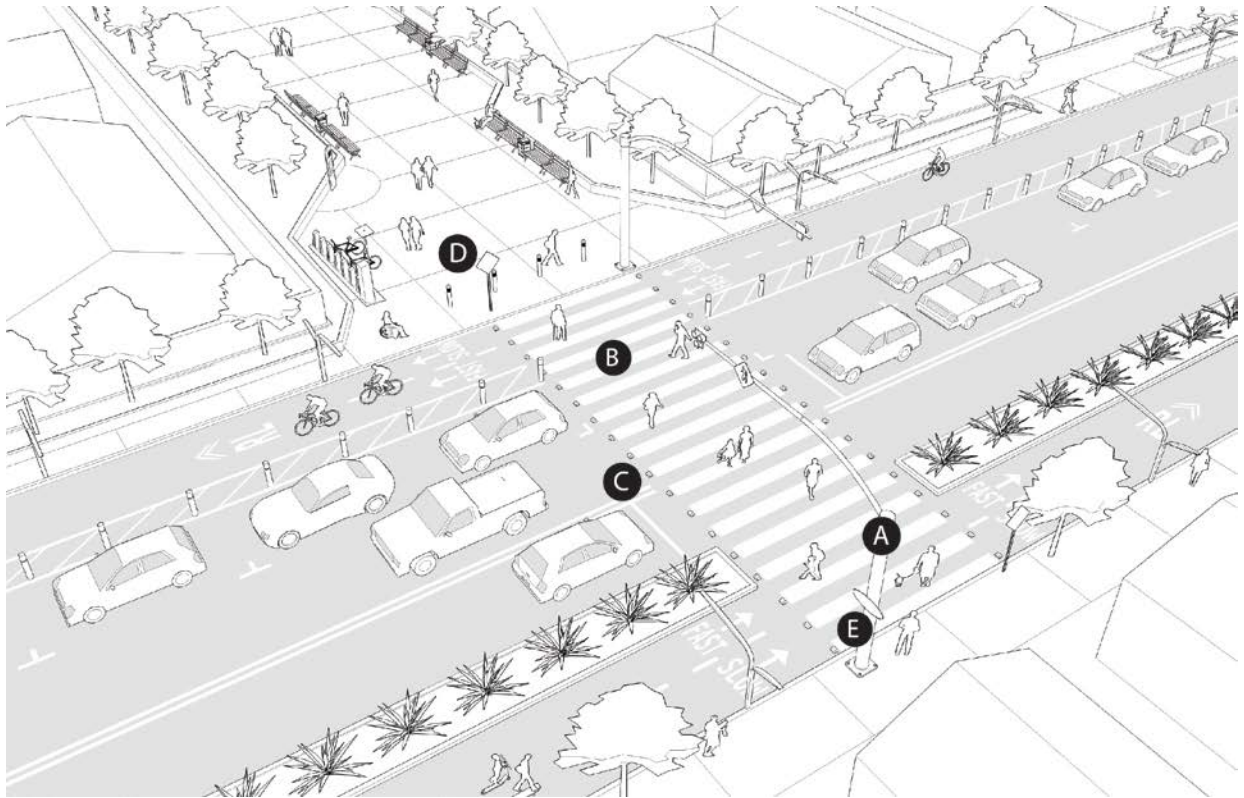
Legend	Complete Path Type II Intersection - Arterial&Collector	Total Cost	Path Lite Type II Intersection - Arterial&Collector	Total Cost	Source*
A	Bulbouts (curb reconstruction, dual curb ramps)	\$ 146,000	Bulbouts (<i>Not Included in Path Lite</i>)	\$ -	16
B	Crosswalks	\$ 2,982	Crosswalks	\$ 2,982	12
C	LED Flashers	\$ 12,240	LED Flashers (<i>Not Included in Path Lite</i>)	\$ -	13
D	Resignalize Signal for Pedestrians	\$ 40,800	Resignalize Signal for Pedestrians (<i>Not Included in Path Lite</i>)	\$ -	18
E	Ped buttons and Audio Chirp	\$ 14,144	Ped buttons and Audio Chirp	\$ 14,144	19
F	Medallion Signage	\$ 2,176	Medallion Signage	\$ 2,176	15
Total		\$ 218,342	Total		\$ 19,302

Legend	Complete Path Intersection Type III – Collector&Collector	Total Cost	Source*
B	Crosswalks	\$ 3,202	12
F	Medallion Signage	\$ 2,176	15
Total		\$ 5,378	

*For Source information, Refer to Appendix A

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Mid-Block Crossing

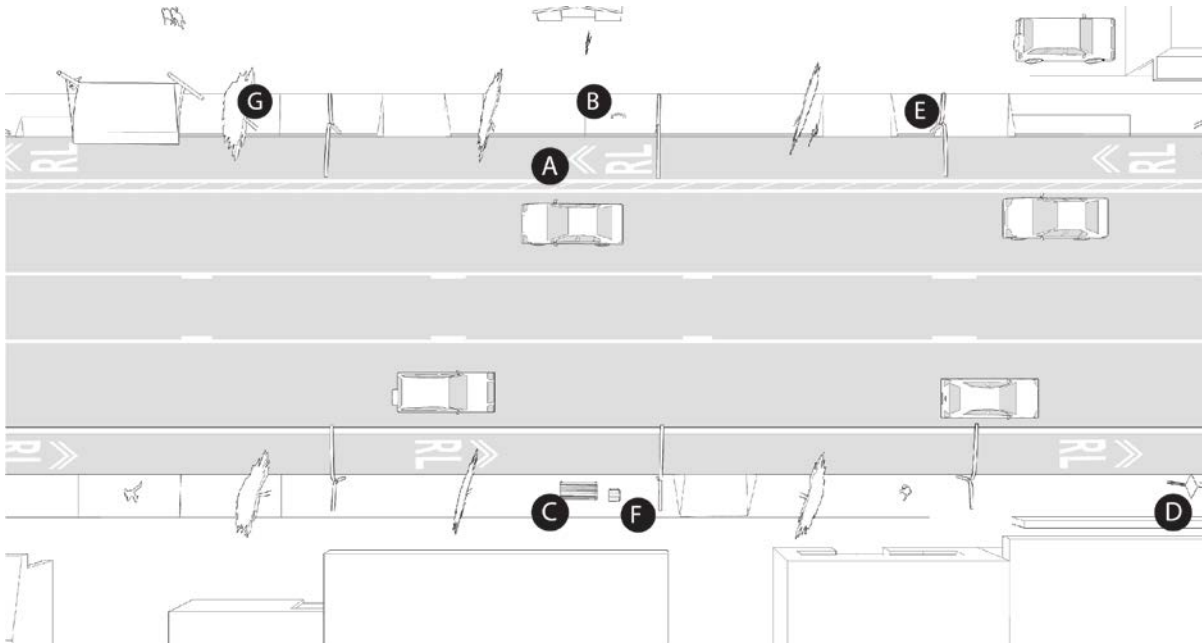


Legend	Complete Path Midblock Crossing	Total Cost	Path Lite Midblock Crossing	Total Cost	Source*
A	HAWK Signal	\$ 146,000	HAWK Signal	\$ 146,000	11
B	Crosswalk Paint (50')	\$ 876	Crosswalk Paint (50')	\$ 876	12
C	LED Flashers	\$ 43,800	LED Flashers (<i>Not Included in Path Lite</i>)	\$ -	13
D	Safety Signage	\$ 584	Safety Signage	\$ 584	14
E	Medallion Signage	\$ 1,168	Medallion Signage	\$ 1,168	15
Total		\$ 192,428	Total	\$ 148,628	

*For Source information, Refer to Appendix A

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Type 1 & 2 Arterial



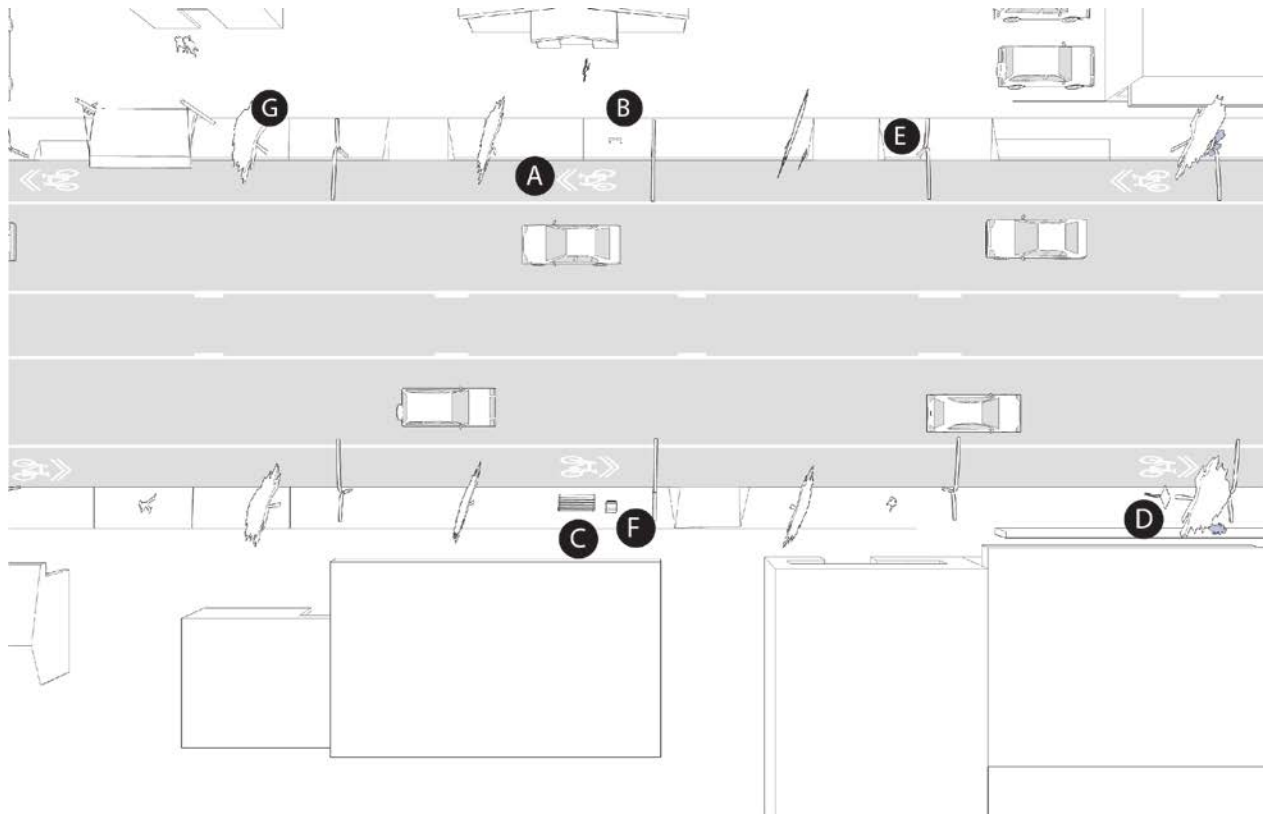
Legend	Complete Path Arterial Type I (250')	Total Cost	Path Lite Arterial Type I (250')	Total Cost	Source*
A	Protected Rolling Lane (Bollards, Green Paint, Painted Stripe)	\$ 20,805	Rolling Lane (Painted Stripe)	\$ 11,863	2
B	Bike Racks (every 500')	\$ 876	Bike Racks (every 500')	\$ 876	4
C	Sidewalk Furniture (every 500')	\$ 2,190	Sidewalk Furniture (Not Included in Path Lite)	\$ -	5
D	Signage (every 250')	\$ 1,168	Signage (every 250')	\$ 1,168	6
E	Lighting (every 100')	\$ 13,286	Lighting (every 100')	\$ 13,286	7
F	Garbage Cans (every 500')	\$ 1,095	Garbage Cans (every 500')	\$ 1,095	8
G	Landscaping (every 500')	\$ 1,329	Landscaping (every 500')	\$ 1,329	9
Total		\$ 40,749	Total		\$ 29,616

Legend	Complete Path Arterial Type II (250')	Total Cost	Path Lite Arterial Type II (250')	Total Cost	Source*
A	Rolling Lane (Painted Stripe)	\$ 11,863	Bike Lane	\$ 1,460	3
B	Bike Racks (every 1000')	\$ 438	Bike Racks (Not Included in Path Lite)	\$ -	4
C	Benches (every 1000')	\$ 1,095	Benches (Not Included in Path Lite)	\$ -	10
D	Signage (every 1000')	\$ 146	Signage (every 1000')	\$ 146	6
E	Lighting (every 125')	\$ 10,629	Lighting (every 125')	\$ 10,629	7
F	Garbage Cans (every 1000')	\$ 548	Garbage Cans (every 1000')	\$ 548	8
G	Landscaping (every 1000')	\$ 2,657	Landscaping (every 1000')	\$ 2,657	9
Total		\$ 27,375	Total		\$ 12,782

*For Source information, Refer to Appendix A

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Collector



Legend	Complete Path Collector (250')	Total Cost	Source*
A	Bike Lane	\$ 1,460	3
B	Bike Racks (every 2500')	\$ 175	4
C	Benches (every 2500')	\$ 438	10
D	Signage (every 500')	\$ 292	6
E	Lighting (every 150')	\$ 8,857	7
F	Garbage Cans (every 2500')	\$ 219	8
G	Landscaping (every 2500')	\$ 266	9
Total		\$ 11,707	

*For Source information, Refer to Appendix A

Appendix A - Cost Estimate Sources

Reference #	Element	Quantity	Cost	Source	Link
1	Protected Rolling Lane	LF	\$ 57.00	LA DOT Case Study	http://ladot.lacity.org/pdf/PDF255.pdf
2	Rolling Lane	LF	\$ 26.51	Chicago Case Study	http://www.suntimes.com/news/metro/14267923-418/more-bike-lanes-planned-for-city.html
3	Bike Lane	LF	\$ 4.00	LA County Appendix	http://dpw.lacounty.gov/pdd/bike/docs/bmp/Appendix%20H.pdf
4	Bike Rack	Each	\$ 1,200.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
5	Sidewalk Furniture	Each	\$ 3,000.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
6	Signage	Each	\$ 400.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
7	Lighting	Each	\$ 3,640.00	Bicycling Info Report	http://www.bicyclinginfo.org/bikecost/docs/NCHRP_7-14_Final_Report_5.pdf
8	Garbage Can	Each	\$ 1,500.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
9	Landscaping	Each	\$ 1,820.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
10	Bench	Each	\$ 3,000.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
11	Hawk	Each	\$ 100,000.00	Case Study	http://www.kcrg.com/home/top-9/Traffic-Engineers-Push-Driver-to-Pay-Attention-to-New-HAWK-Signals-188140591.html
12	Crosswalk Paint	LF	\$ 6.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
13	LED Flashers	Intersection	\$ 120,000.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
14	Safety Signage	Each	\$ 200.00	Bicycling Info Report	http://www.bicyclinginfo.org/bikecost/docs/NCHRP_7-14_Final_Report_5.pdf
15	Medallion Signage	Each	\$ 400.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
16	Bulbouts	Intersection	\$ 100,000.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
17	Ped Detection Padding	Intersection	\$ 8,000.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
18	Resignalize Intersection for Pedestrians	Intersection	\$ 30,000.00	Walking Info	http://www.walkinginfo.org/pedsafe/pedsafe_curb1.cfm?CM_NUM=37
19	Ped buttons and audio chirp	Intersection	\$ 10,400.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
20	Information Kiosk	Intersection	\$ 3,000.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
21a	Paint	400 LF	\$ 2,400.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
21b	Low Height Planter Boxes	4	\$ 7,280.00	CA MTC	http://www.mtc.ca.gov/planning/bicyclespedestrians/Ped_Districts/04-Generic-Cost-Estimating-Tool.pdf
21	Painted Bulbout	Intersection	\$ 9,680.00	Source in 21a,21b	



IBI Group
18401 Von Karman Avenue—Suite 110
Irvine CA 92612 USA
tel 949 833 5588
fax 949 833 5511

Memorandum

To/Attention	Sarah Jepson	Date	August 20, 2013
From	IBI Group	Project No	32903
cc		Steno	CDF
Subject	Task 4.1 Modal Access Targets Summary Memo		

This memorandum provides a summary of the evaluation of available analytical tools, models, and methodologies that could assist the Los Angeles County Metropolitan Transportation Authority (Metro) and the Southern California Association of Governments (SCAG) in determining or calculating modal access targets for different time horizons (for example 5 to 10 years) as well as different station types. The objective of this sub-task was to identify not only the modal access targets, but also to identify a single tool that could be used to evaluate multi-modal strategies and the magnitude of potential model access changes.

This technical memorandum builds on the findings of Task 3.4 Case Study Analysis, as well as discussions conducted between the consultant team, Metro and SCAG. Our analysis incorporates the agreed upon site typologies and available data regarding first-last mile access modes. New research was conducted by IBI to identify and assess the potential use of predictive tools that could be used to assess the implementation of first-last mile improvement strategies.

During the course of this research, it became apparent that there is limited existing information and a limited number of models and/or methodologies focused on assessing how improvements to transit station accessibility for non-motorized and active transportation modes could result in mode share changes for a particular station. Instead, many of the existing methodologies and sources focus on either quantifying ridership in total for transit systems or assessing the quality or performance of the transportation environment and infrastructure for pedestrians or bicyclists. The linkages between these two assessments are currently tenuous at best.

This technical memorandum includes the following elements:

- Existing Modal Access – A summary of the existing modal access information available from the Metro Origin-Destination Study
- Tools Analyzed – A review and summary of each tool researched and analysis for this task
- Findings – A summary of the findings and conclusions of this analysis
- Application of the proposed metrics to three case study sites

Summary of Key Findings

- Based on our review of the most recent O-D data provided by Metro, there is significant variation in the observed existing modal access percentages from station to station and from place type to place type. This variation makes it difficult to identify or recommend a system-wide modal access target. Instead, identifying modal access targets, or more

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appropriately goals percentage increase in active transportation access, by place type would appear to be a more achievable goal.

- A wide range of station access models, ridership models, and pedestrian and bicycle environment assessment tools were reviewed and evaluated as part of this memo. This evaluation revealed that there is no current single tool that provides the analysis capability sought by Metro in the original scope of work for this project. Selected tools, in particular the First & Last Mile (FLAM) Strategic Model tool being tested in Portland, OR could provide applicability to Los Angeles County in the future.
- In the absence of single tool for assessing changes to modal access targets, IBI Group developed a separate interim tool that could be used by Metro to analyze station access and the potential changes to ridership based on improvements to the active transportation network.
- This tool was applied at three station areas and was used to assess the potential benefits of the implementation of the Metro Path at each station. Using the tool, forecasted increases in ridership resulting from the Metro Path improvements ranged from 1.5% to 3% based on existing ridership numbers.

Existing Modal Access Data

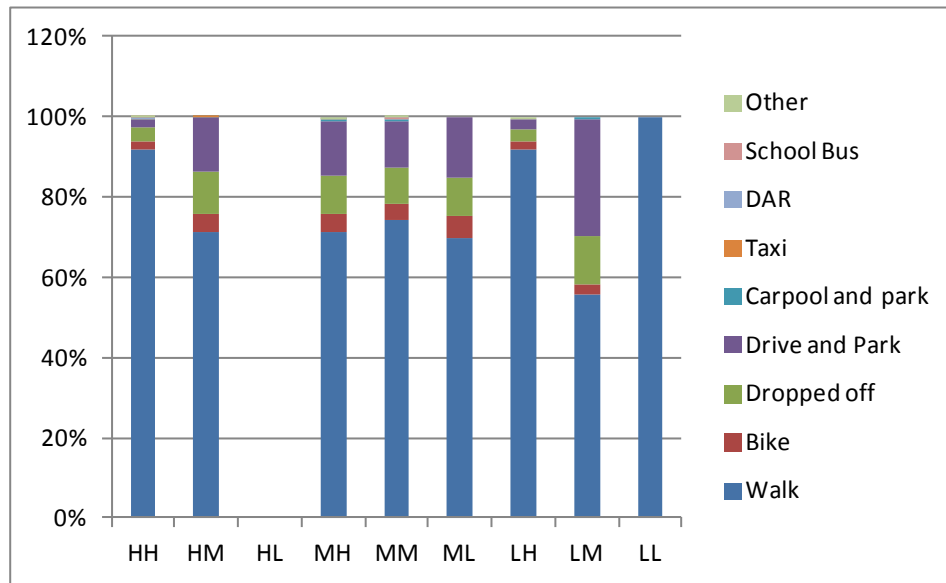
The data provided through the Metro Origin-Destination (O-D) Study conducted in 2011 was analyzed through the perspective of modal access at high capacity transit stations within Los Angeles County. The O-D data was collected from the universe defined in the Case Study Site selection Report, which corresponds to the nine different station typologies (four different CSPP Accessibility Clusters) as defined in previous tasks. It should be noted that while transit line information was available, the number of responses by line or by station was not always significant. For example, the high density residential and low centrality station typology is not represented in this analysis because the only station in this category is part of the Metrolink system, not the Metro transit network, and therefore O-D data was not available for that specific site.

In reviewing the O-D data, it was observed that no direct or consistent correlations existed between station types and modal access, as illustrated in Figures 1 through 3.

Figure 1 presents the modal access shares according to each of the nine station typologies, with highest auto access observed in the Low Residential and Medium Centrality station typology. The highest non motorized access with a significant number of records is observed in two of the High Centrality typologies (Low and High Residential).

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Figure 1 – Modal Access Share for Station Typologies

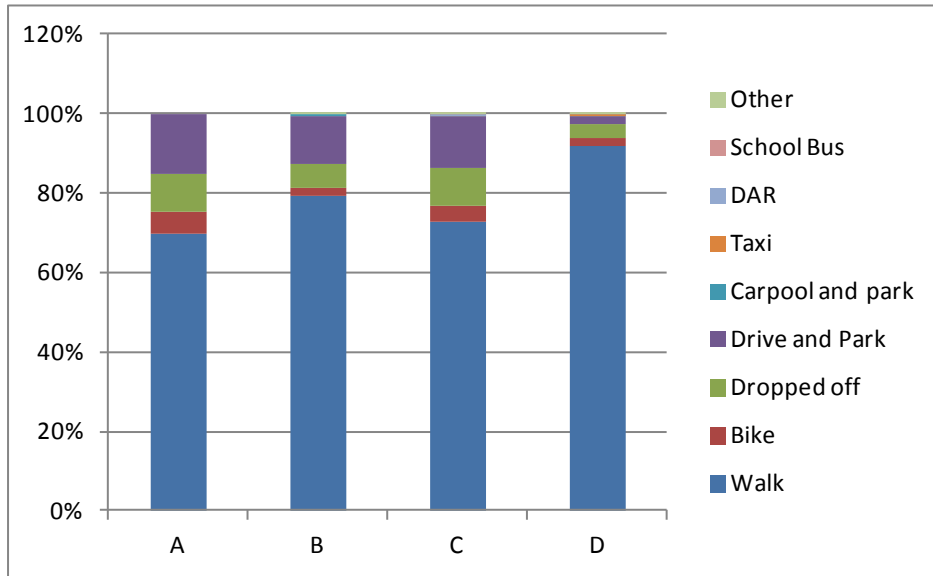


Notes: Percentages based on number of responses
 Number of responses for LL not statistically significant

The aggregation of the data to CSPP Accessibility Cluster types reduces the variation related to modal access, but differences are still present among the categories, as can be observed in Figure 2.

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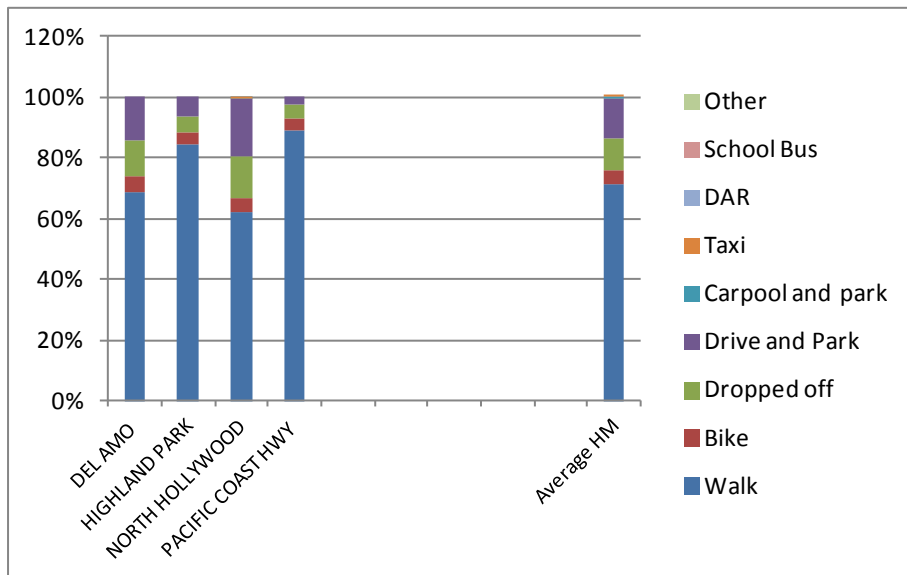
Figure 2 – Modal Access Share for Station Clusters



Notes: Percentages based on number of responses
 Cluster A (HL, ML), Cluster B (LH, LL, LM), Cluster C (MH, MM, HM), Cluster D (HH)

Further variation is observed within each station typology. For example, in the High Residential and Medium Centrality typology, the modal access share for the stations that had the most responses varies as shown in Figure 3.

Figure 3 – Modal Access Share for Stations within the High Residential and Medium Centrality Typology



Notes: Percentages based on number of responses
 Stations with low response are not shown, but included in the average for the station typology

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The differences in access mode shares can be explained by station access, station characteristics and also differences in the mix of trip generators. For example, both Highland Park and North Hollywood are stations included as Case Study Sites, and were evaluated according to a set of categories observed during a site visit. These two stations had similar ratings regarding safety and aesthetics, but the North Hollywood Station was given a lower rate for accessibility than the Highland Park station, consistent with the modal access share obtained from the survey.

Motorized access to the station is more dependent on the convenience of the station (location within a route for drop-off) and parking availability, than the network itself. These types of users also have, in general, a longer commute to reach the desired station.

The majority of transit users access their routes through non-motorized modes, and the size of the active transportation shed varies according to the network around the desired station. As identified in previous documents, the size of this shed is dependent on the existence of connections, but also on the quality of these conditions, given that not all types of users have the same mobility.

Due to the observed variation in modal access shares between stations and between the nine place types, a regional modal access target is not recommended as an adequate goal to be included in the First-Last Mile Strategic Plan. Instead, a possible alternative approach to the countywide access targets would be to set improvement targets per station type, improving the non-motorized access performance of the stations, so the average shifts towards the maximum shares observed by station place type.

Table 1 illustrates the observed pattern of modal access by station place type. This information was obtained through tabulation of the data for the Metro stations that had more than 100 responses or a response rate at or above 2% of the station’s daily boardings.

Table 1 – Modal Access Ranges per Place Type - Metro OD Survey 2011

Place Type	Expected Modal Access	Walk	Bike	Dropped off	Drive and Park	Carpool and park	Taxi	DAR	School Bus	Other
High Residential High Centrality	Maximum	99%	10%	12%	24%	2%	2%	1%	1%	2%
	Average	90%	2%	4%	3%	0%	0%	0%	0%	0%
	Minimum	70%	0%	0%	0%	0%	0%	0%	0%	0%
High Residential Medium Centrality	Maximum	93%	7%	15%	19%	0%	0%	0%	0%	0%
	Average	77%	4%	8%	11%	0%	0%	0%	0%	0%
	Minimum	60%	0%	3%	0%	0%	0%	0%	0%	0%
High Residential Low Centrality	Maximum	100%	3%	9%	0%	3%	0%	0%	0%	0%
	Average	97%	1%	2%	0%	0%	0%	0%	0%	0%
	Minimum	91%	0%	0%	0%	0%	0%	0%	0%	0%
Medium Residential High Centrality	Maximum	91%	9%	18%	41%	5%	1%	1%	0%	3%
	Average	71%	4%	9%	14%	0%	0%	0%	0%	0%
	Minimum	45%	2%	0%	1%	0%	0%	0%	0%	0%
Medium Residential Medium Centrality	Maximum	95%	7%	15%	54%	1%	0%	3%	1%	2%
	Average	74%	3%	9%	14%	0%	0%	0%	0%	0%
	Minimum	30%	0%	3%	0%	0%	0%	0%	0%	0%

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Place Type	Expected Modal Access	Walk	Bike	Dropped off	Drive and Park	Carpool and park	Taxi	DAR	School Bus	Other
Medium Residential Low Centrality	Maximum	70%	13%	13%	19%	0%	0%	0%	0%	0%
	Average	68%	8%	11%	13%	0%	0%	0%	0%	0%
	Minimum	67%	3%	8%	7%	0%	0%	0%	0%	0%
Low Residential High Centrality	Maximum	96%	4%	6%	16%	0%	0%	0%	0%	4%
	Average	89%	2%	3%	5%	0%	0%	0%	0%	1%
	Minimum	80%	2%	0%	0%	0%	0%	0%	0%	0%
Low Residential Medium Centrality	Maximum	76%	3%	13%	41%	1%	0%	0%	0%	0%
	Average	60%	2%	12%	25%	0%	0%	0%	0%	0%
	Minimum	44%	1%	11%	9%	0%	0%	0%	0%	0%
Low Residential Low Centrality	Maximum	100%	4%	4%	0%	0%	0%	0%	0%	0%
	Average	97%	1%	2%	0%	0%	0%	0%	0%	0%
	Minimum	93%	0%	0%	0%	0%	0%	0%	0%	0%

Note: Modal access ranges were estimated considering bus stop data for the Low Residential/Low Centrality and High Residential/High Centrality to improve number of responses

Stations with a large park and ride infrastructure are likely to have a different behavior in regards to access shares than stations with smaller or no park and ride infrastructure. In this case, as the motorized access comprises a larger share of station access, improvements to non-motorized access to these stations may not produce substantial changes in non-motorized access percentages that are as noticeable as for other stations. The place types with the largest amount of park and ride facilities and number of parking spaces will most likely contribute to a lower average in non-motorized access shares. An example of target could be to improve the non-motorized average share as follows:

- 5% - 10% for the place types with average shares below 70%
- 2.5% - 5% for the place types with average shares between 70% and 85%
- Up to 2.5% for the place types with average shares over 85%

It must be noted that the O-D Survey was designed to focus on the bus and rail lines as a whole, and does not always provide enough entries for each station or stop along the lines analyzed. It is recommended that the information contained in Table 1 be refined through the conduction of a future O-D survey at the stations in order to obtain mode share statistics that are statistically representative of universe of stations analyzed.

Tools Analyzed

The scope calls for assessment of potential tools and methodologies for establishing modal access targets by place types. However, given the conclusion of the previous section, it has become apparent that the examination of tools that can evaluate modal access and active transportation access on a station to station basis is also warranted for this assessment.

The variation in modal access by station within individual place types is a result of numerous factors, which would be difficult to harmonize across stations. Additionally, stations that currently have high pedestrian and cyclist mode splits may have greater potential for ridership gains from these modes than stations with mode splits below an arbitrary target. Given this condition, we

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think that the focus of these tools should be on measuring how overall access, and consequently ridership, can improve, more than modal access percentages.

All documents analyzed as part of this research suggests or shows that transit ridership is directly affected by accessibility, as well as use/urban design variables (population density, employment density, land use mix, land use balance).

Each of the five tools reviewed for this assessment is discussed below.

TCRP Report 153

The Transit Cooperative Research Program Report 153: Guidelines for Providing Access to Public Transportation Stations provides a process and a tool to assist in planning for access to high capacity transit stations. The methodology has been developed considering data and input from several agencies throughout the country, and the eight-step process identified for station access is illustrated in Figure 4.

Figure 4 – Eight-step station access planning flowchart



Source: TCRP Report 153, 2012

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Station access is in general multi-modal, and the research has found that the predominant access travel modes are dependent on several characteristics:

- Type of land use
- Street spacing
- Development density
- Station infrastructure and connection to surroundings

TCRP Report 153 developed a set of station typologies that would illustrate the general characteristics of typical transit stations, and therefore allow for the analysis of the attributes of access/egress mode characteristics. Individual typologies relate to physical factors present at the station and in a 0.5 mile area around the station. The typologies were defined considering housing density, building scale, distance from CBD, supporting transit network, pedestrian/bike access, parking facilities, and access/egress, as illustrated in Figure 5.

One drawback with the potential use of this tool is that the stations are evaluated according to their access typology and not to their place type classification. Therefore, in order to use this methodology, there would need to be a reallocation of stations based on access instead of place type. The report also provides an average station access mode share for each station type, illustrated in Figure 6.

Figure 5 – Station Access Typology

Station Area Type	Housing Density	Scale (# of stories)	Dist. from CBD	Supporting Transit Network	Ped/Bike Access	Surrounding Land Use	Access/Egress	Parking Facilities	Example Stations	Rapid Transit Modes
Urban Commercial	High	>5	0-10 miles	Intermodal facility/transit hub	High-quality network; good connectivity	Office, residential, institutional, retail, entertainment, and civic uses	Both	No off-street parking	16th Street/Mission (BART) Lloyd Center (TriMet) East Liberty (Port Authority)	Heavy Rail Light Rail BRT
High-Density Urban Neighborhood	High	>5	0-10 miles	Subregional hub	High-quality network; good connectivity	Residential, neighborhood retail, limited office	Access	No/limited off-street parking	Kingsbridge Road (NYCT)	Heavy Rail
Medium-Density Urban Neighborhood	Medium	2-5	5-10 miles	Some local bus connections	High-quality network; good connectivity	Residential, neighborhood retails	Access	No/limited off-street parking	Western – Pink Line (CTA) West Baltimore (MARC) Othello Station (Sound Transit) Euclid Ave/71st St (Cleveland RTA) Hoboken – 14th Street (NY Waterway)	Heavy Rail Commuter Rail Light Rail BRT Ferry
Urban Neighborhood with Parking	Medium	2-5	5-10 miles	Subregional hub	High-quality network; high-volume roadways may limit connectivity	Residential, neighborhood retail	Access	Off-street parking available	Anacostia (WMATA)	Heavy Rail
Historic Transit Village	Medium-High	2-5	10-40 miles	Some local bus connections	High-quality network; good connectivity	Residential, neighborhood retail, limited office	Access	Some off-street parking	Greenwich Station (Metro North)	Commuter Rail
Suburban TOD	Medium-High	2-8	5-15 miles	Some local bus connections	Good network within station area some high-volume roadways	Residential, neighborhood retail	Both	Some off-street parking	Beithesda (WMATA) Davis Street (Metra) Orenco Station (TriMet) Tunney's Pasture (OC Transpo)	Heavy Rail Commuter Rail Light Rail BRT
Suburban Village Center	Medium-High	2 – 5	5-15 miles	Subregional hub	Limited connectivity, some high-volume roadways	Residential, neighborhood retail, commercial	Access	Some off-street parking available	Downtown Littleton (RTD) Van Nuys (LA Metro)	Light Rail BRT
Suburban Neighborhood	Low-Medium	1 – 3	5-15 miles	Some local bus connections	Limited connectivity, some high-volume roadways	Residential, retail, limited office	Access	Some off-street parking available	South Bank (PAT) Pleasant Park (OC Transpo) Route 915 - Columbia (MTA) Quincy (MBTA)	Light Rail BRT Commuter Bus Ferry
Suburban (Freeway)	Low	0-2	10-20 miles	Employer shuttles, limited bus connections	Isolated, difficult connections	Varies	Both	Park-and-ride prioritized	Owings Mills (MTA)	Heavy Rail
Suburban Employment Center	Low	1 – 3	5-15 miles	Some local bus connections, employer shuttles	Poor connectivity, high-volume roadways	Office, retail and limited residential	Egress	Park-and-ride prioritized	McCormick Road (MTA) Maple Island (Lane Transit)	Light Rail BRT
Suburban Retail Center	Low	1 – 3	5-15 miles	Some local bus connections	Poor connectivity, high-volume roadways	Retail, limited office	Egress	Park-and-ride prioritized	Great Mall Transit Center (VTA) Warner Center (LA Metro)	Light Rail BRT
Intermodal Transit Center	Low-Medium	1-3	5-15 miles	Intermodal facility/transit hub	Good connections between systems; isolated	Varies	Both	Park-and-ride often prioritized	Forest Hills (MBTA) Mukilteo (Sound Transit) Bellevue Transit Center (Sound Transit)	Heavy Rail Commuter Rail Commuter Bus Ferry

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Station Area Type	Housing Density	Scale (# of stories)	Dist. from CBD	Supporting Transit Network	Ped/Bike Access	Surrounding Land Use	Access/Egress	Parking Facilities	Example Stations	Rapid Transit Modes
Hoboken Transit Terminal (NY Waterway)										
Freeway/Highway Park & Ride	Low	0-2	15-40 miles	Employer shuttles, limited bus connections	Isolated, difficult connections	Varies	Both	Park-and-ride prioritized	Golden Glades (TriRail) I-485/South Blvd (CATS) Eagleson (OC Transpo) Sammamish Park & Ride (Sound Transit)	Commuter Rail Light Rail BRT Commuter Bus
Busway	Varies	Varies	10-30 miles	Subregional hub	High-volume roadways, difficult connections	Varies	Access	Park-and-ride prioritized	El Monte Bus Station (LA Metro)	Commuter Bus
Special Event/Campus	Low-Medium	1 - 3	Varies	Some local bus connections	Limited connectivity with emphasis on special facility	Entertainment, airport, and/or civic uses	Egress	Limited off-street parking available	Hartsfield Airport (MARTA) Hamburg Street (MTA) Airport Station (MBTA)	Heavy Rail Light Rail BRT
Shuttle Station	Low	0-2	15-40 miles	Employer, airport, special event shuttles	Isolated, difficult connections	Varies	Egress	Some off-street parking	Great America (ACE)	Commuter Rail
Satellite City	Low-Medium	1-3	>30 miles	Subregional hub	High-quality network; good connectivity	Residential, retail, limited office	Both	Park-and-ride prioritized	Elgin (Metra) Port Townsend (WSDOT Ferry)	Commuter Rail Ferry
Legacy	Low	0-2	Varies	Limited connections	Isolated, difficult connections	Varies	Access	Some off-street parking	St. Denis (MARC)	Commuter Rail

Source: TCRP Report 153, 2012

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Figure 6 – Average station access mode share by station type

Station Type	Average Access Mode Percentage				
	Walk (%)	Bicycle (%)	Feeder Bus (%)	Auto (Drop-off) (%)	Auto (Park-and-Ride) (%)
Urban Commercial High-Density Urban Neighborhood	82	1	10	2	5
Medium-Density Urban Neighborhood	72	2	14	4	10
Urban Neighborhood with Parking	80	1	9	4	7
Historic Transit Village	35	3	21	10	31
Suburban TOD	25	1	3	17	53
Suburban Village Center	32	2	13	14	39
Suburban Neighborhood	30	2	16	12	40
Suburban Freeway	29	1	11	13	46
Suburban Employment Center	10	1	12	12	65
Suburban Retail Center	29	3	25	9	36
Intermodal Transit Center	30	2	19	11	39
Special Event/Campus	27	1	36	6	30
Satellite City	55	2	24	6	13
	7	6	12	16	59

Source: TCRP Report 153, 2012

The guidelines regarding station access can be used for existing and for new stations. The TCRP Report 153 is accompanied by a spreadsheet tool that can be used to estimate station ridership and mode access share. The station typology is used to govern the arrival modes that should be encouraged or discouraged at particular types of stations. The model does not focus on active transportation access, and the tool does not estimate the benefits for non-motorized/active transportation access improvements to the station. The tool provides an estimate of new walk trips based on transit-oriented development, as well as target bicycle access boardings, but these are not linked to non-motorized access improvements.

The spreadsheet is straightforward, and the data needed for the analysis includes station characteristics, demographics in 0.5 mile radius, station daily boardings, access mode split (existing or by station type – default values), and other station data related to parking and management strategies. The analysis is focused on the assessment of impacts of changing parking supply/costs and the implementation of TOD on ridership. Improvements to walk access to a station are suggested to be effective if the mode share is a lot smaller than the mode share considered for the typology standard, and the user is referred to the Guidebook for a list of potential pedestrian improvements. A similar approach is used in the analysis of bicycle access, where improvements are considered likely to be effective only if the bicycle mode share is less than 1.5 times the bicycle commute mode share. In terms of bicycle commute mode share, it must be noted that the input data is for Census Place (American Communities Survey), which means that data would be aggregated for an area much larger than a typical station area.

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Station access improvement opportunities listed for pedestrians and bicyclists include:

- Provide paved sidewalks at least 5 feet wide
- Remove sidewalk clutter near station entrances
- Provide station entrances through the buildings
- Build pedestrian overpasses and/or underpasses
- Provide weather-protected connections to adjacent land use
- Install traffic signals at busy junctions
- Improve night visibility
- Install intersection safety improvements (e.g., crosswalks)
- Install wayfinding on approaches to station
- Install bicycle lanes
- Provide bicycle paths
- Provide secure bicycle storage at stations

The strengths of this tool include the representation of a variety of station types, but the application relies heavily on data collection on access mode shares, as no improvements to non-motorized modes are considered to be effective if the defaults existing in the tool are used. This tool is useful to assess changes to ridership given changes to parking configuration and management, as well as the implementation of transit-oriented development in the station area, but does not provide an assessment of the impacts of changes to the non-motorized access to the station.

Direct Ridership Model of Bus Rapid Transit in Los Angeles County

The direct ridership model proposed by Cervero, Murakami and Miller (University of Berkeley Center for Future Transport, 2009) estimates boardings at a BRT stop or station as a function of three sets of variables:

- Service attributes: frequency, operating speeds, feeder bus connections, dedicated lanes, vehicle brand/marketing, etc.
- Location and Neighborhood attributes: population and employment densities, mixed land use measures, median household incomes, vehicle ownership, distance to nearest stop, accessibility levels, terminal station, street density, connectivity indices (number of intersections divided by number of links, where a higher number indicates in general a more walkable environment), etc.
- Bus Stop/Site attributes: shelters, next bus passenger information, benches, far-side bus stops, park-and-ride lots, bus bulbs, etc.

The model was proposed considering 50 Metro Rapid stops, 13 Orange Line Stops and 6 Big Blue Bus stops, and the coefficients are shown in Figure 7.

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Figure 7 – Direct Ridership Model for BRT in Los Angeles County

	Coefficient	Std. Error	Beta	T Statistic	Sig.
<i>Service Attributes</i>					
Number of Daily Metro Rapid Buses (both directions)	5.103	1.353	.176	.371	.000
Number of perpendicular daily feeder bus lines (both directions)	73.921	36.045	.080	2.051	.045
Number of perpendicular daily rail feeder trains (both directions)	6.722	1.934	.126	3.476	.001
<i>Neighborhood Attributes</i>					
Population Density (1/2-mile buffer)	0.017	0.004	.134	4.303	.000
Distance to nearest BRT stop (in miles)	261.705	150.751	0.060	1.736	.088
<i>Interactive Terms</i>					
BRT & Feeder Bus: Dedicated Lane (0-1)* Number of perpendicular daily feeder bus lines	124.557	62.121	.123	2.005	.050
BRT & Feeder Rail: Dedicated Lane (0-1)* Number of perpendicular daily rail feeder trains	52.891	3.831	.533	13.807	.000
BRT & Parking Capacity: Dedicated Lane (0-1)* Park-and-Ride Lot Capacity	.514	.249	.093	2.067	.043
BRT & Total Density: Dedicated Lane (0-1)* (Population +Employment density within 1/2-mile buffer)	.036	.011	.185	3.202	.002
Constant	-541.164	154.71	--	-3.50	.001
<i>Summary Statistics:</i> R Square = 0.952 F Statistic (prob.) = 129.011 (.000) N=69					

Source: Cervero, R., Murakami, J, Miller, M. - Direct Ridership Model of Bus Rapid Transit in Los Angeles County, UC Berkeley Center for Future Urban Transport: A Volvo Center of Excellence, Institute of Transportation Studies (UCB), UC Berkeley, June 2009

As can be observed in Figure 7, the proposed multiple regression model includes as variables the quality of high capacity service provided in the station area buffer, population and employment densities, presence (or not) of dedicated lane, parking supply and distance to the nearest BRT stop. Even though distance to next stop is used to capture the size of the catchment area, there are no variables related to the walkability within the station area (as connectivity indices are not present in the proposed model). The model captures changes in service, as well as changes in density and parking capacity, but is not designed to capture changes to the active transportation network, which reduces its applicability for the assessment of the impacts of first-last mile strategies.

LRT First & Last Mile (FALM) Strategic Model

Viacity is a GIS-based pedestrian, bicycle and transit connectivity planning service and software developed by the Transpo Group. The software uses Route Directness Index (RDI), which is a comparison of the straight line distance between two points with the actual route between these points. The more direct a route is, the higher the RDI is, with RDI equal to 1.0 if the route is a straight line. These metrics have been packaged to serve as input to a tool, the LRT First & Last Mile (FALM) Strategic Model, which would allow for the estimation of walk connectivity to stations, as well as the increase in station boardings resulting from improvements to walk connectivity. It considers the effect of the built environment variables around the station:

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- Density – population and employment
- Diversity – mix of land use
- Design – quality of the urban street network
- Destination accessibility – LRT service frequency
- Distance to transit – walk connectivity

The FALM Strategic Model was developed through the application of multiple regression analysis to determine the “built environment” variables that have the strongest influence on predicting daily walk boardings at 28 non-downtown LRT stations within the Portland urban area. Similar to the tool proposed in the TCRP Report 153, it uses data made available through the Center for Transit Oriented Development (CTOD), but employs a set of measures of land parcel-specific connectivity to LRT stations within a 0.5 mile buffer based on RDI.

Parcel-based RDI measurements for high capacity transit station areas have been applied in recent studies to stations/stops for Sound Transit, Tri-Met and DART.

This tool has great potential to assess the impacts of changes to non-motorized access within the vicinity of the station area, but the efficiency and transferability of the model to other transit systems (other Cities/agencies as well as other modes – heavy rail, commuter rail and BRT) are not contemplated in the existing version, but are considered to be next steps of the process. This is a weakness of this tool, but this could be overcome with the appropriate data collection and calibration to local conditions.

http://www.viacity.info/wp-content/uploads/2012/02/ViaCity_FALM_Model.pdf

Ridership+

Ridership+ is a series of regression-based direct ridership forecasting tools developed by Fehr and Peers. This tool incorporates livability values, and has been used in the development of forecasts for the BART system in San Francisco and also utilized in Los Angeles County in the Westside Subway Extension, Westside Mobility Plan and the Downtown Los Angeles Streetcar Project. The tool has been used in streetcar, bus rapid transit, light rail and heavy rail projects, most of them in California. The model was used to estimate ridership changes on the BART system contains, along with the traditional variables of population, employment and parking supply at the stations, a walkability measure, where the design of the street network and pedestrian environment affect ridership.

The focus of this model has been high capacity transit. This model has been developed as a forecast model for future stations and estimates ridership for new stations based on existing patterns and behavior rather than estimating changes to demand at existing stations, which reduces its applicability in the assessment of the anticipated impacts to ridership at existing transit stations due to the implementation of first-last mile strategies at these stations. Therefore, this model does not meet the requirements of this study.

Pedestrian Environmental Quality Index/ Bicycle Environmental Quality Index (PEQI/BEQI)

The Pedestrian Environmental Quality Index (PEQI) is a tool developed by the San Francisco Department of Public Health and used to prioritize improvements in pedestrian infrastructure during the planning process. The PEQI is an observational survey that quantifies street and intersection factors empirically known to affect people's travel behaviors. Thirty-one empirical indicators are organized into five categories: intersection safety, traffic, street design, land use

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and perceived safety. The data collected is entered into a customized Microsoft Access table, and a score is produced reflecting the quality of the pedestrian environment.

Bicycle Environmental Quality Index (BEQI), also developed by the San Francisco Department of Public Health, is a quantitative observational survey developed to assess the bicycle environment on roadways and evaluate what streetscape improvements could be made to promote bicycling in San Francisco. Twenty-one indicators are organized into 5 categories for this tool.

These two tools can be used to help assess the quality of the infrastructure along access routes to the station and further refine the access sheds for each station. It is a very time consuming process, as data has to be entered for each stop and each segment considered, but is a valuable tool to understand the anticipated perceived changes to the non-motorized environment

These tools are good for assessing improvements to infrastructure, but are not applicable for assessing the how these improvements would change ridership. Combined with a quantitative tool like FALM, they could provide for the adequate assessment of accessibility and ridership.

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Proposed Metrics

The proposed metrics to analyze the impact of first-last mile strategies on station ridership are a combination of the tools analyzed on the previous pages. The assessment of the impact of adding or changing the parking conditions at the station as well as the implementation of transit-oriented development can be assessed through the use of the tool provided in the TCRP Report 153, and the metric analyzed should be the estimated passenger gain given the cost of implementation of the strategy.

For non-motorized access, it is suggested that the change in ridership be estimated given the change in the access shed. FALM, the most elaborate tool available, is currently not calibrated for Los Angeles County, and therefore it is proposed that initially, the shed be calculated considering the population and employment that can reach the station in a 15 minute timeframe, given the existing network, and the existing access share for the station being analyzed, and that the metric analyzed should be the estimated passenger gain given the cost of implementation of the strategy. This provides for a comparison, if need be, to the implementation or increase in parking at stations.

Changes to walking time can be implemented by providing adequate and accessible sidewalks which increases the average walking speed, providing more crossing points as well as improved crossing at heavy pedestrian traffic intersections, providing bike paths and signalization, as well as improving bicycle facilities at the stations that are operating at capacity.

Tool Analysis Findings

Access conditions vary significantly between motorized and non-motorized modes from station to station and place type to place type. Therefore, it is recommended that Metro consider the application of a hybrid approach to determine the likely impact of changes to station ridership given changes to accessibility in the station area. One tool would be focused on changes regarding parking and TOD strategies and one on active transportation strategies.

The identification of modal access targets for transit stations and stops is a task that can be best accomplished after the data regarding existing mode access is compiled for the several types of stations that exist in the County of Los Angeles. The O-D survey provides a good set of data, but the sampling plan was developed according to Metro routes, and not Metro stations. The survey also only captures the users that are already in the system, and not those that could be part of the system if access conditions compatible with their needs were provided to stations.

Instead of regional access targets, due to variation observed in the station access mode shares for the various station types (and also within station types) it is proposed that Metro consider a range of access shares as a reference point and test and implement strategies that can change the average share for the place type to reflect Metro's active transportation policies. In regards to metrics, non-motorized and motorized related access improvements to stations can be assessed through:

1. Non-motorized access: The increase of the active transportation shed around the stations, with the goal of increasing the number of riders as the shed expands. For example, the expected increase in ridership can be defined given the change between the population/employment within a 0.5 mile buffer around the station and the population/employment that can actually reach the station given the characteristics of the active transportation network available and the network with the proposed improvements.

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2. Motorized access: The changes to ridership given parking strategies as well as implementation of transit-oriented developments in the station area.

All models identified as potential candidates rely heavily on station data. Some of the data regarding socioeconomic variables surrounding the station/stop can be obtained from the United States Census or from other sites such as the Center for Neighborhood Technology's TOD Database (toddata.cnt.org), but the data gathering is labor intensive and time consuming, which increases as further geographic detail is needed.

In the near future, the benefits of the proposed active transportation projects can be assessed through station surveys, while existing models identified in this memo are refined to reflect the access behavior within Los Angeles County and therefore be suitable to be used as predictive of the anticipated changes in station mode access.

Most research has been conducted on high capacity transit stations or stops. The TCRP Report 153 provides for standard mode splits according to several station types, but it must be noted that the use of this tool regarding the assessment of changes to station area access is heavily dependent on the use station specific data. The TCRP Report 153 also is more focused on the changes to ridership given changes to parking and TOD characteristics, and does not consider non-motorized access improvements directly in the model. The model can be used for predicting changes to ridership given changes to land use (TOD development) as well as changes to parking supply and strategies, but is not effective in predicting the changes in mode access and ridership given improvements to the non-motorized network.

The methodology proposed in the LRT First & Last Mile (FALM) Strategic Model captures the benefits of adding or improving non-motorized connections to the station area, but this model has to date only been tested on a small number of stations, and needs to be further enhanced to incorporate a larger data set, with a greater variety of locations and access modes in order to provide portability. The most important feature of this model is the incorporation of the possibility of changing the built environment and the anticipated increase in non-motorized access modes. It must be noted that this methodology requires parcel-level data in order to compute the RDI. It is recommended that Metro monitor the further development of this tool, as it can provide quantitative benefits to connection improvements, but it is unlikely that this tool can be immediately applied to stations in Los Angeles County. In the meantime, the overlay of the access shed and the available socioeconomic data (Census 2010 and other) can provide for an assessment of the likely impact of changes to non-motorized station access.

It must be noted that improvements should not be guided solely by the changes predicted to ridership, given that some improvements to station access area cannot be captured directly by the proposed models, and a more holistic approach is recommended to augment the information available for decision makers.

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Application of Interim Station Access Assessment Tool

This section presents the application of the interim tool recommended to analyze station access. The application is focused on the non-motorized access to the station, and the methodology and results are presented in the following pages. This interim tool has been developed by IBI to provide Metro with an evaluation tool in the interim timeframe while other tools (in particular to FLAM tool profiled above) are further developed and refined by others to provide better measurements of ridership changes resulting from changes to station accessibility.

The methodology for the interim tool is straightforward, and relies heavily on GIS data, with the most time consuming task being the coding of the network for the conditions to be analyzed. The shed size and shape is cross-referenced spatially with socioeconomic data to obtain input for the calculation of access increase and expected increase in ridership.

The increase in ridership relevant to the ridership for the station must be carefully analyzed, as many stations have high percentage of transfers. The implementation of active transportation improvements does increase the quality of the transfer for those already in the system, as the system becomes more efficient in terms of overall time for a trip.

When assessing the impacts of the implementation of first-last mile strategies in areas where station density is such that the half-mile bands overlap, caution should be exercised in order to not double count the changes in socioeconomic data, which can lead to an overestimate of the potential new riders.

The methodology is not capable of measuring the effect of the improvements on the choice of people that live or work within the existing shed. To capture this shift in behavior, pre- and post-implementation surveys should be conducted at the stations where the Metro Path is implemented. The proposed methodology yields numerical results that are considered conservative in terms of the potential change in modal access.

Methodology

The proposed interim methodology was applied to the three station areas that were selected as case study sites for the Path Network: North Hollywood, Watts/103rd and Wilshire/Normandie. This methodology is GIS-based, and the software used was TransCAD, developed by Caliper Corporation, a widely used software, and the same software utilized to develop SCAG's regional travel demand model. The procedure uses the TransCAD's GIS and network functions.

Inputs to the procedure consisted of:

- Census Data
 - Census block geographic database
 - Population 2010 (Source: Census)
 - Total employment 2010 (source: Census - LEHD Origin-Destination Employment Statistics (LODES))
- Street Network
 - Street network geographic database (source: Caliper)
- Metro Rail Stations (source: Metro, complemented by IBI)
 - Geographic database containing all Metro stations

The following paragraphs outline the step-by-step procedure followed to assess the impact of the Metro Path network on the non-motorized access shed around a given rail station, as well as a high-level estimate of the potential ridership increase that can be associated with the increase of the size of the access shed.

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First, a half-mile band was generated around each station to be analyzed, and the street and sidewalk network within the area was detailed to represent the existing pedestrian infrastructure.

The pedestrian infrastructure includes the representation of sidewalks on each side of the street, striped crossings and crossings at non-striped locations, as well as other pedestrian connections such as overpasses. Travel time was allocated for each link, based on the following assumptions:

- Sidewalks or pedestrian paths with no interaction with traffic – speed of 2 mph
- Pedestrian crossings at signalized intersections – speed of 2.4 mph, plus 27s delay (average estimated time that pedestrians would have to wait for the walk signal)
- Pedestrian crossings at striped non-signalized intersections or locations – 2.4 mph (no delay was added as it was assumed that vehicles would be more aware of pedestrians, and the latter would be able to cross the street shortly after arriving)
- Pedestrian crossings at non-striped locations – 2.4 mph, plus 30s delay (average estimated time that pedestrians would wait for a break in traffic before crossing)

Freeways and other express roadways included in the GIS database were not considered as pedestrian infrastructure and were coded to ensure that these links, even though part of the database, were not a viable option for the pedestrian to use when walking to and from the station.

Once the base pedestrian infrastructure was coded, TransCAD was used to generate a transportation network, and then network bands were built around the station and overlaid with the Census layer, providing the base assessment of the non-motorized access shed. The bands were built considering 5-minute travel intervals and represent the distances that can be reached from the station within 15 minute time period. The shape of the band is an indicator of how the pedestrian infrastructure affects accessibility to the station.

The street database was modified to include the changes proposed by the Metro Path concept for the station being analyzed. New network and associated network bands were then generated, providing the assessment of the applied Path Network shed. Changes to infrastructure included the inclusion of new connections and improvement of existing connections such as the consideration of shorter crossing distances at signalized intersections as well as the striping of crosswalks. Travel time allocated for each link was recalculated considering the input above, with the exception of the time to cross the street at signalized intersections, where the added time (delay) was reduced from 27s to 24s to account for signal phasing improvements.

The socioeconomic data for each of the infrastructure configurations was then input into a Microsoft Excel spreadsheet to estimate the net change in access to station and the potential benefits in terms of ridership that the increase in access could provide.

The following pages contain the results obtained for the three stations analyzed.

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North Hollywood Station

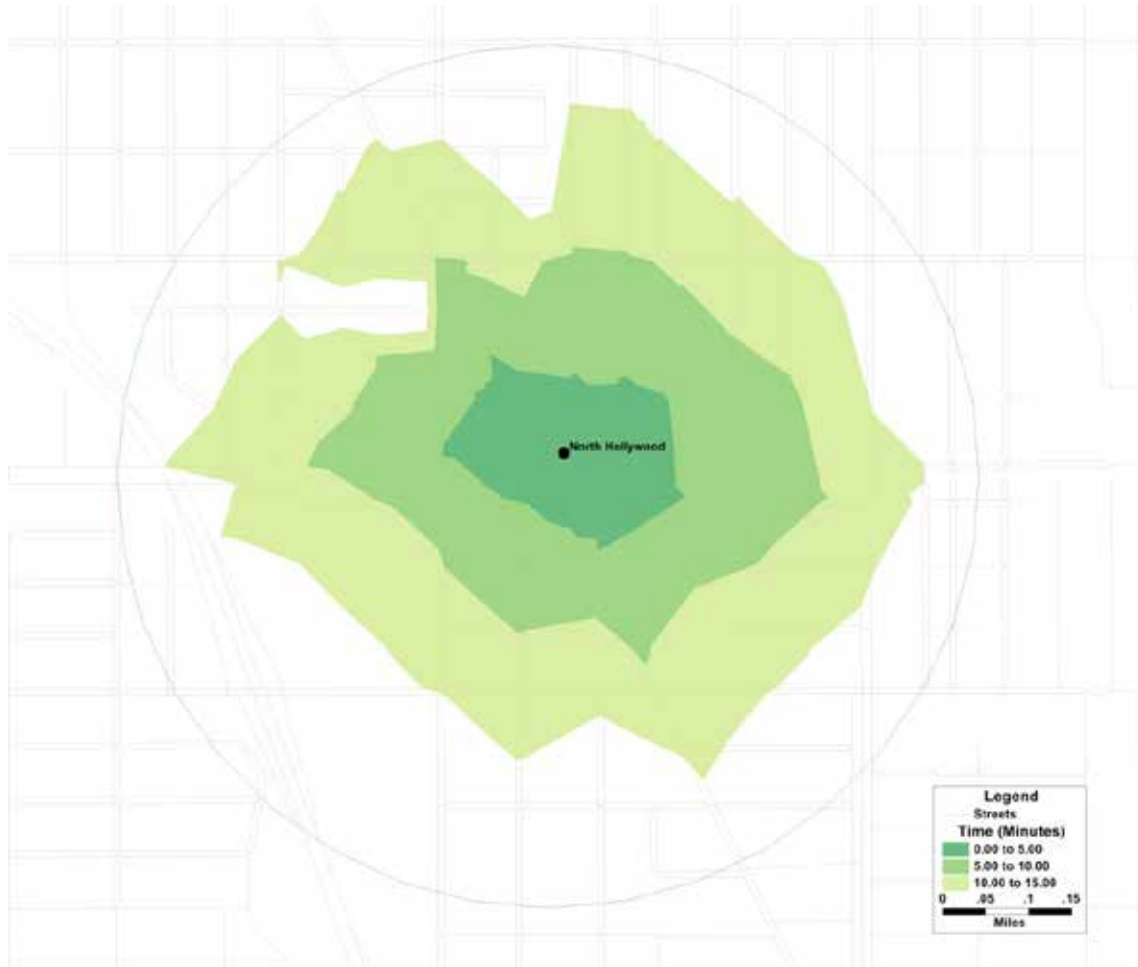
North Hollywood is the terminus station for the Metro Red Line and for the Metro Orange Line. The two station areas are separated by Lankershim Boulevard, and the station area to the east (Metro Red Line) has a park-and-ride lot located next to it, as well as a small bus terminal. This station is among the Metro stations with the highest boardings. For purposes of analysis, the location of the Red Line station was considered as the origin for the time analysis. Socioeconomic data within a 0.5 mile (15-minute walk without any interference) from the station is as follows:

- Population – 11,675
- Workers – 5,130
- Jobs – 4,535

It is important to note that the urban fabric and street layout play a strong role in the definition of access routes to the station. Considering the same average speed for walking on sidewalks (2 mph), the existing infrastructure, the number of street crossings (signalized, striped only or not marked), in a 15-minute period of time, it is anticipated that the number of residents (population), workers and jobs reached would be about half of the amount existing in the circular 0.5 mile band around the station. The shape of the existing 15-minute access shed is shown in Figure 7.

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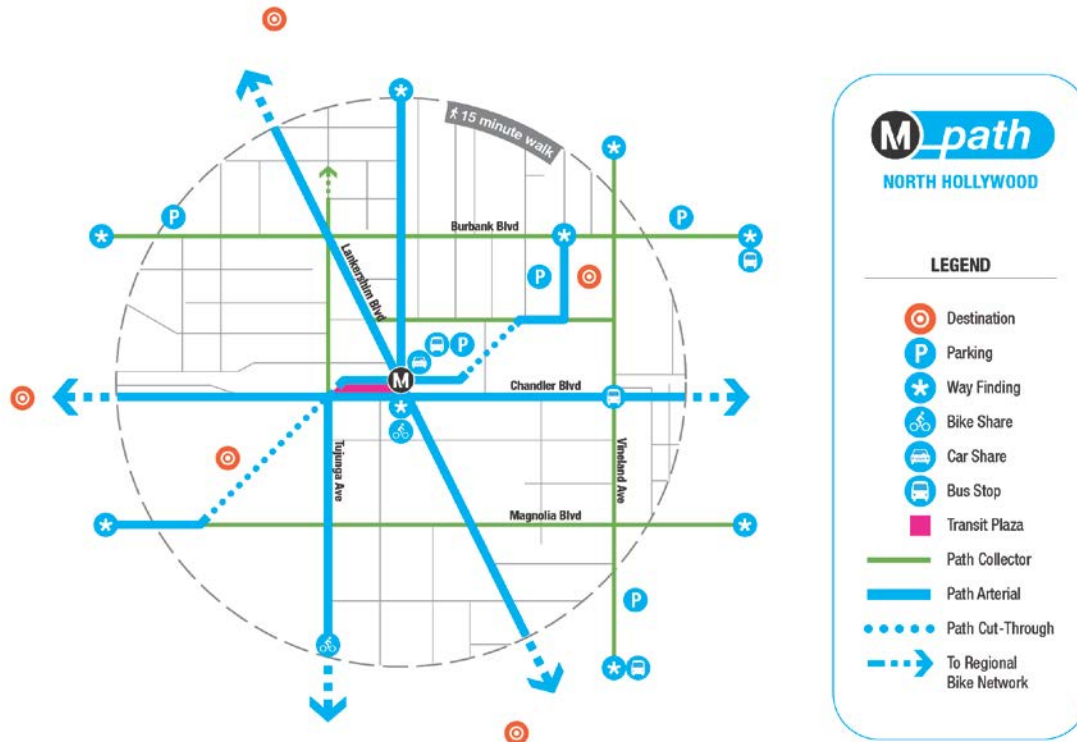
Figure 7 – Existing 15-minute walk access shed – North Hollywood Station



The analysis of the area surrounding the station indicated that there were numerous active transportation connections that could be improved. Figure 8 illustrates the Metro Path concept for the North Hollywood station area.

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Figure 8 – Metro Path Concept – North Hollywood Station



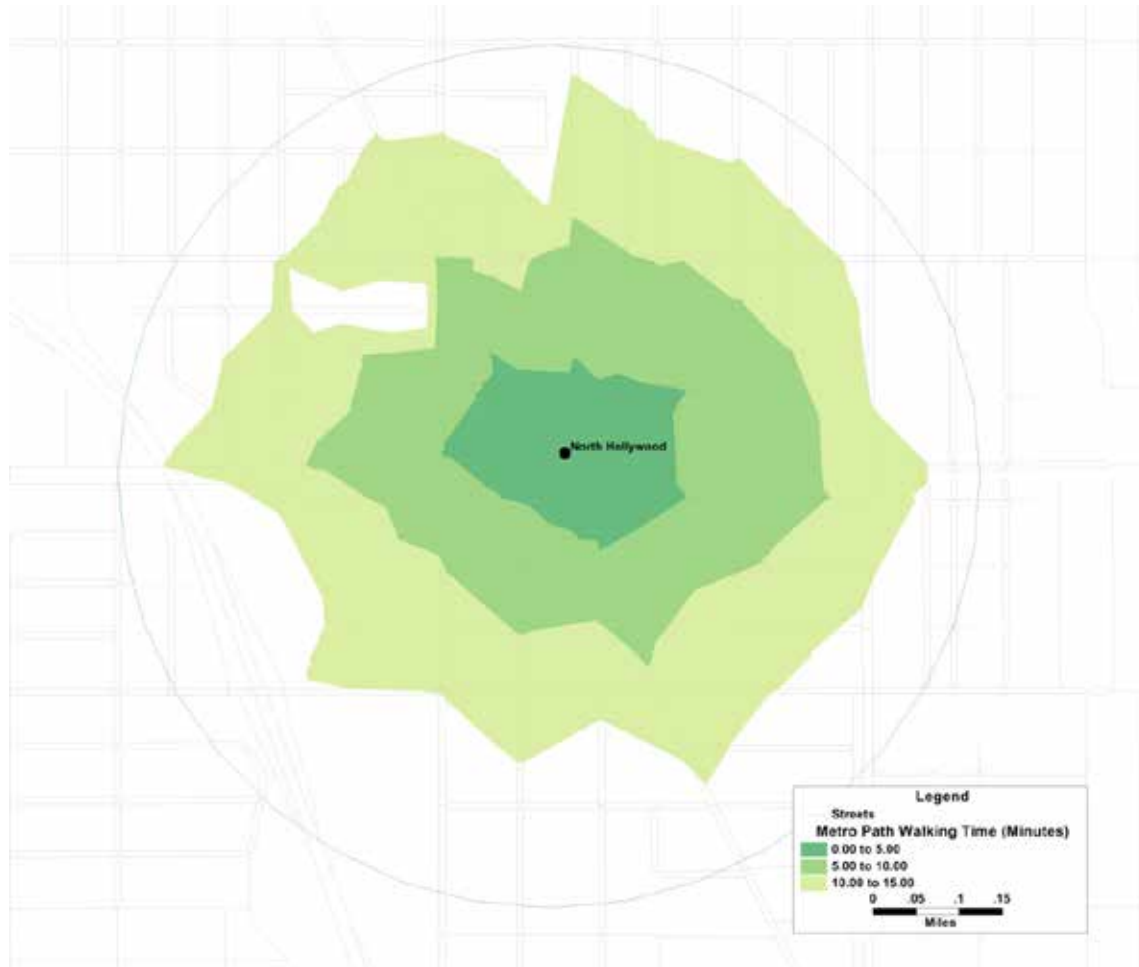
The implementation of the Metro Path concept in the network surrounding the North Hollywood station includes the following elements:

- Inclusion of a pedestrian cut-through in the parking lot in order to streamline the connection from the area north-east of the station
- Inclusion of a pedestrian cut-through in the North Hollywood Park to increase the shed in the southwest direction
- Time gains regarding improvements at signalized intersections
- Time gains due to improvements at pedestrian crossings along the Path Arterial connections

These improvements to pedestrian access and travel time in the area surrounding the station expanded the 15-minute access shed, as can be seen in Figure 9.

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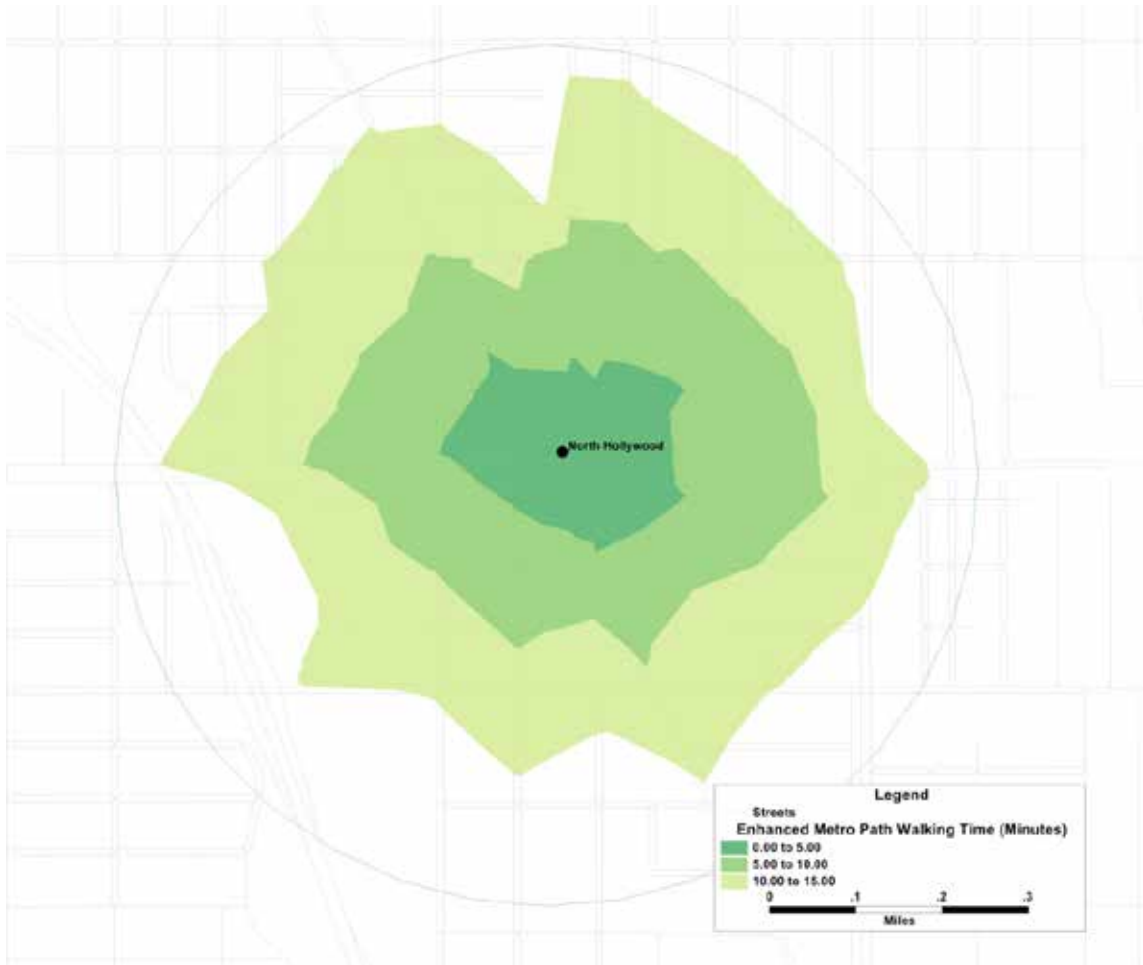
Figure 9 – Metro Path 15-minute walk access shed – North Hollywood Station



The Metro Path enhancements increase the access shed within the half-mile boundary, but there is still a pocket northwest of the station that is out of reach of the 15-minute travel time period. This is because there is no outlet for the street to connect to Lankershim Boulevard. If a connection could be established, the observed gap would close. It was also observed that there are a number of intersections that do not have pedestrian crossing treatments in the vicinity of the station, many of them located on Path Collectors. A second network including these extra connectivity enhancements was tested, and the results regarding the access shed are displayed in Figure 10.

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Figure 10 – Enhanced Metro Path 15-minute walk access shed – North Hollywood Station



The application of the additional improvements to the pedestrian network increased the overall accessibility to the station, and it is estimated that the population and employment levels within a 15 minute walk increases about 5% in the first scenario tested, and over 15% for the enhanced access scenario. Assuming a similar magnitude change in ridership, these improvements could result in a ridership increase of as high as 100 to 200 boardings per day at the station above current levels. However, the ridership survey indicates that North Hollywood is a station with a large number of transfers, with about 70% of the riders boarding the Metro Red Line at that location coming from other bus lines or from the Orange Line. Under these circumstances, the resulting forecast increase in ridership given the change in accessibility to the station would range from about 2% to 4% above current levels.

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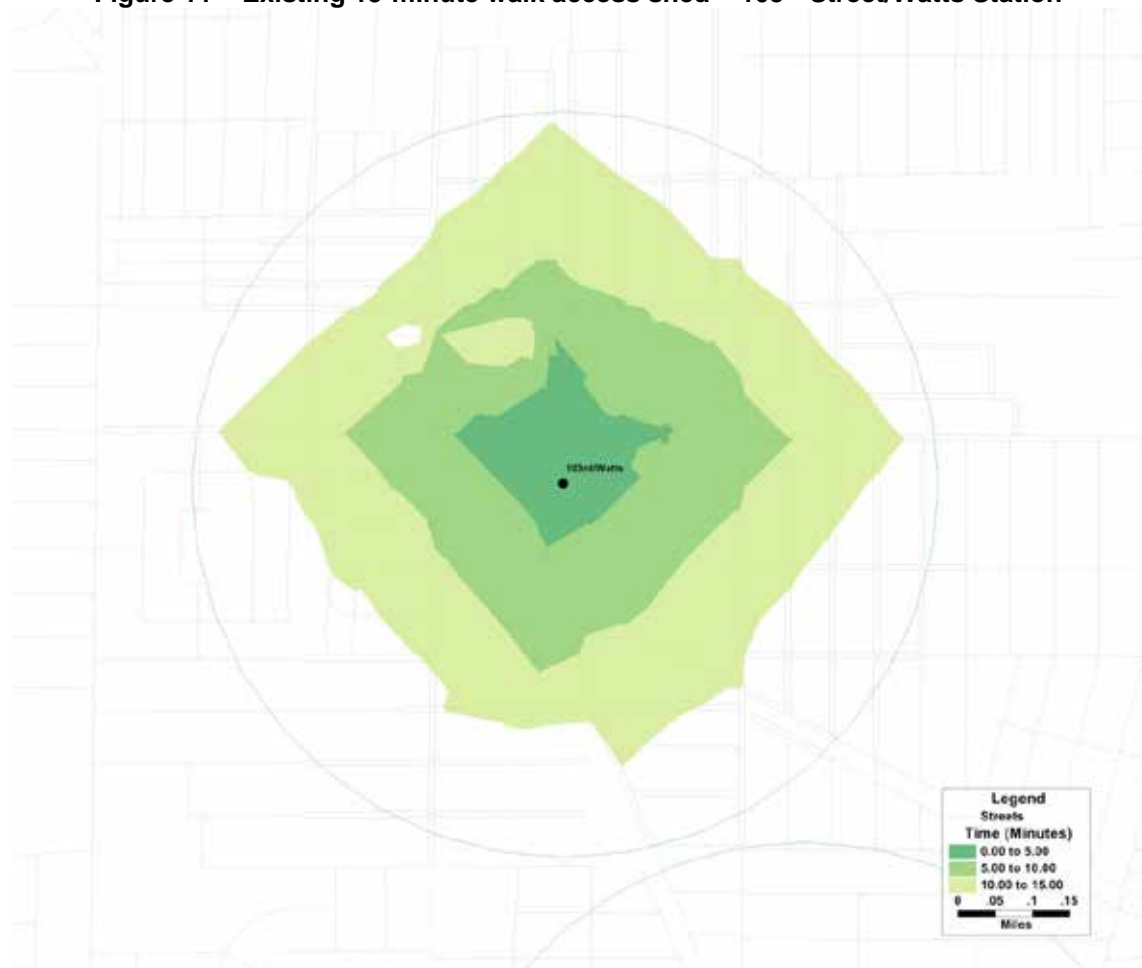
103rd Street/Watts Station

The 103rd Street/Watts Station is a station located along the Metro Blue Line, in the vicinity of Grandee Avenue and 103rd Street. Socioeconomic data within a 0.5 mile (15-minute walk without any interference) from the station is as follows:

- Population – 12,672
- Workers – 3,170
- Jobs – 1,529

The pedestrian network in the area is constrained by gated communities, as well as by the rail tracks. Considering the same average speed for walking on sidewalks (2 mph), the existing infrastructure, the number of street crossings (signalized, striped only or not marked), in a 15-minute period of time, it is anticipated that the number of residents (population), workers and jobs reached would be about half of the amount existing in the circular 0.5 mile band around the station. The shape of the existing 15-minute access shed is shown in Figure 11.

Figure 11 – Existing 15-minute walk access shed – 103rd Street/Watts Station



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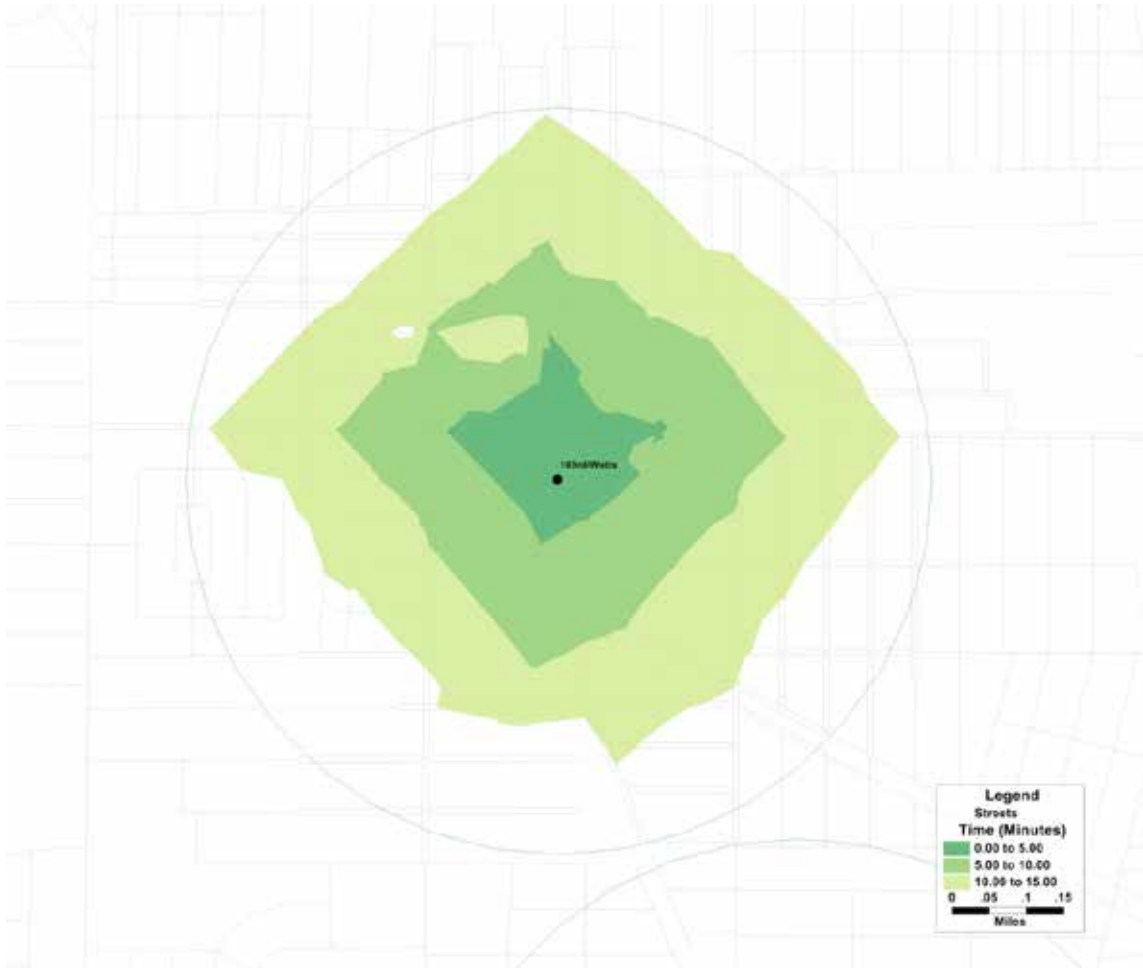
Figure 13 – Metro Path 15-minute walk access shed – 103rd Street/Watts Station



Additional improvements to the street network resulted in a slight increase in shed size, as can be seen in Figure 14.

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Figure 14 – Enhanced Metro Path 15-minute walk access shed – 103rd Street/Watts Station



The access to the station from the south is one of the constraints that impacts the size and shape of the access shed. The application of the improvements to the pedestrian network increased the overall access to the station, and it is estimated that the population and employment within a 15 minute walk increases about 2% in the first scenario tested, and 4% for the enhanced access scenario, which could result in a ridership increase of 15 to 30 boardings per day at the station. The ridership survey indicates that 103rd Street/Watts is a station with a small number of transfers, with only 25% of the riders boarding the station from other transit lines. The resulting forecast increase in ridership given the change in accessibility to the station would range from about 1.5% to 3%.

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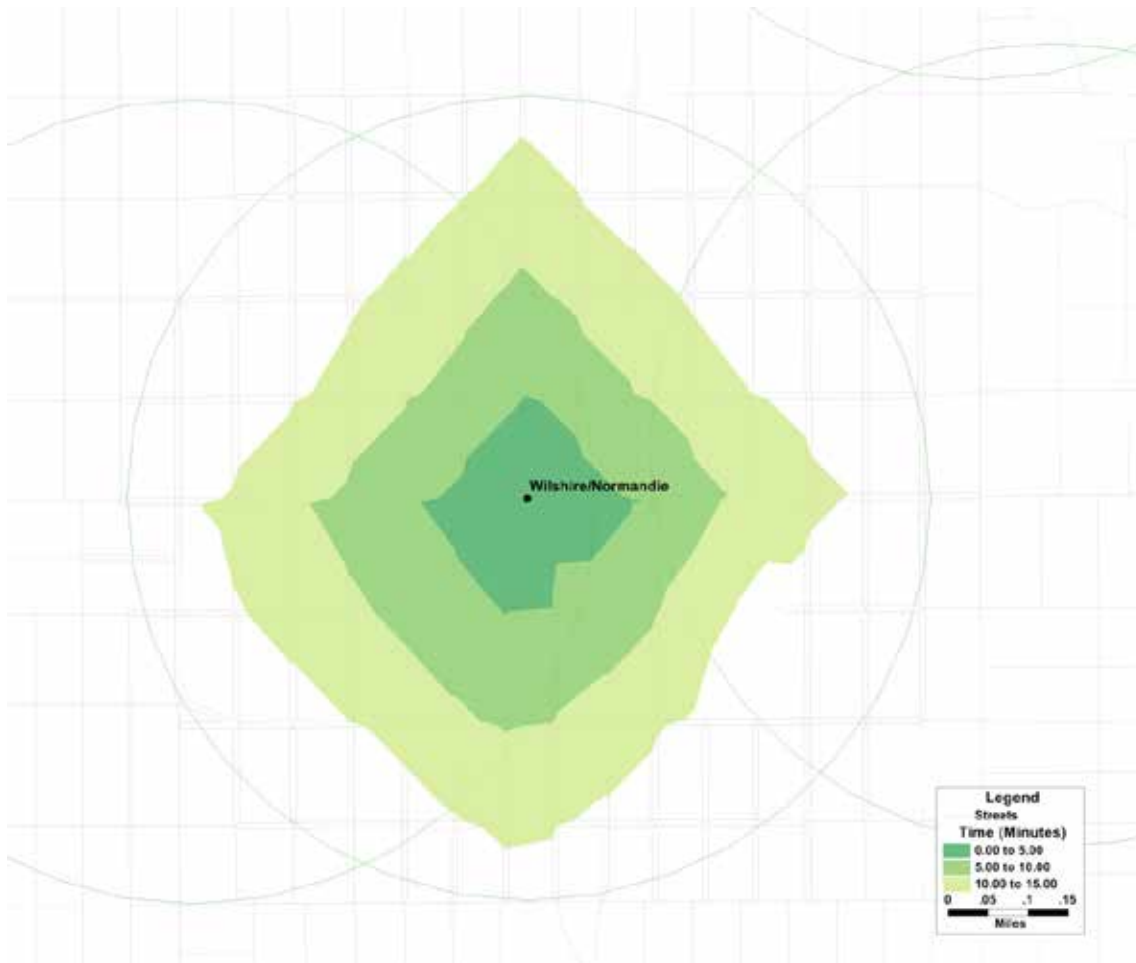
Wilshire/Normandie Station

The Wilshire Normandie Station is a station located along the Metro Purple Line, in the vicinity of Wilshire Boulevard and Normandie Avenue. This station is located in a high density area, as can be observed from the socioeconomic data within a 0.5 mile (15-minute walk without any interference) of the station:

- Population – 38,838
- Workers – 12,278
- Jobs – 23,302

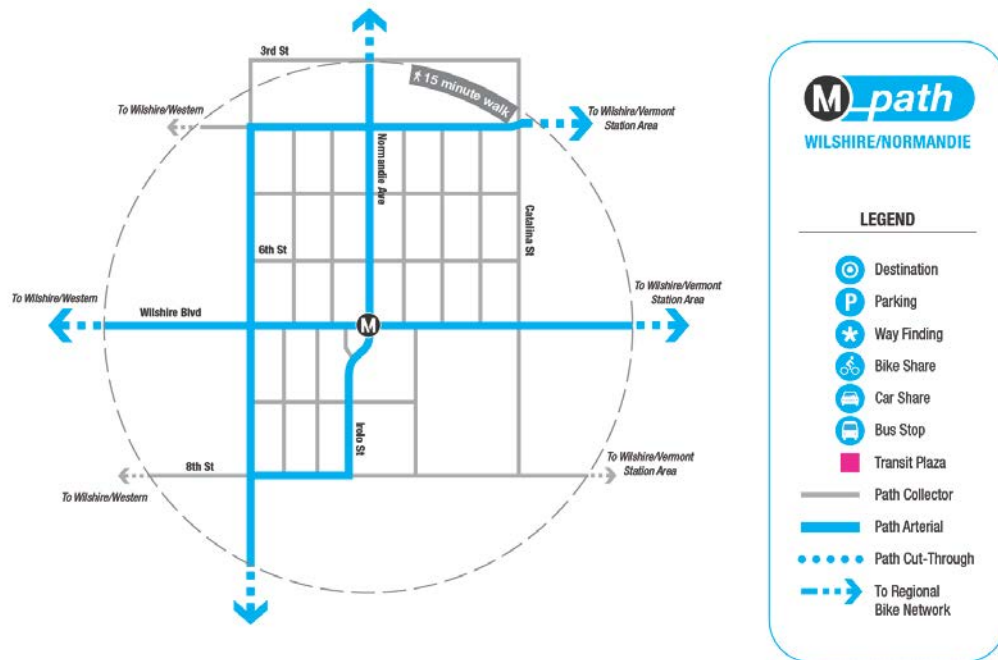
The street grid in this station area is regular and closely spaced. Considering the same average speed for walking on sidewalks (2 mph), the existing infrastructure, the number of street crossings (signalized, striped only or not marked), in a 15-minute period of time, it is anticipated that the number of residents (population), workers and jobs reached would be about half of the amount existing in the circular 0.5 mile band around the station. The shape of the existing 15-minute access shed is shown in in Figure 15. The proposed Path concept is illustrated in Figure 16.

Figure 15 – Existing 15-minute walk access shed – Wilshire Normandie Station



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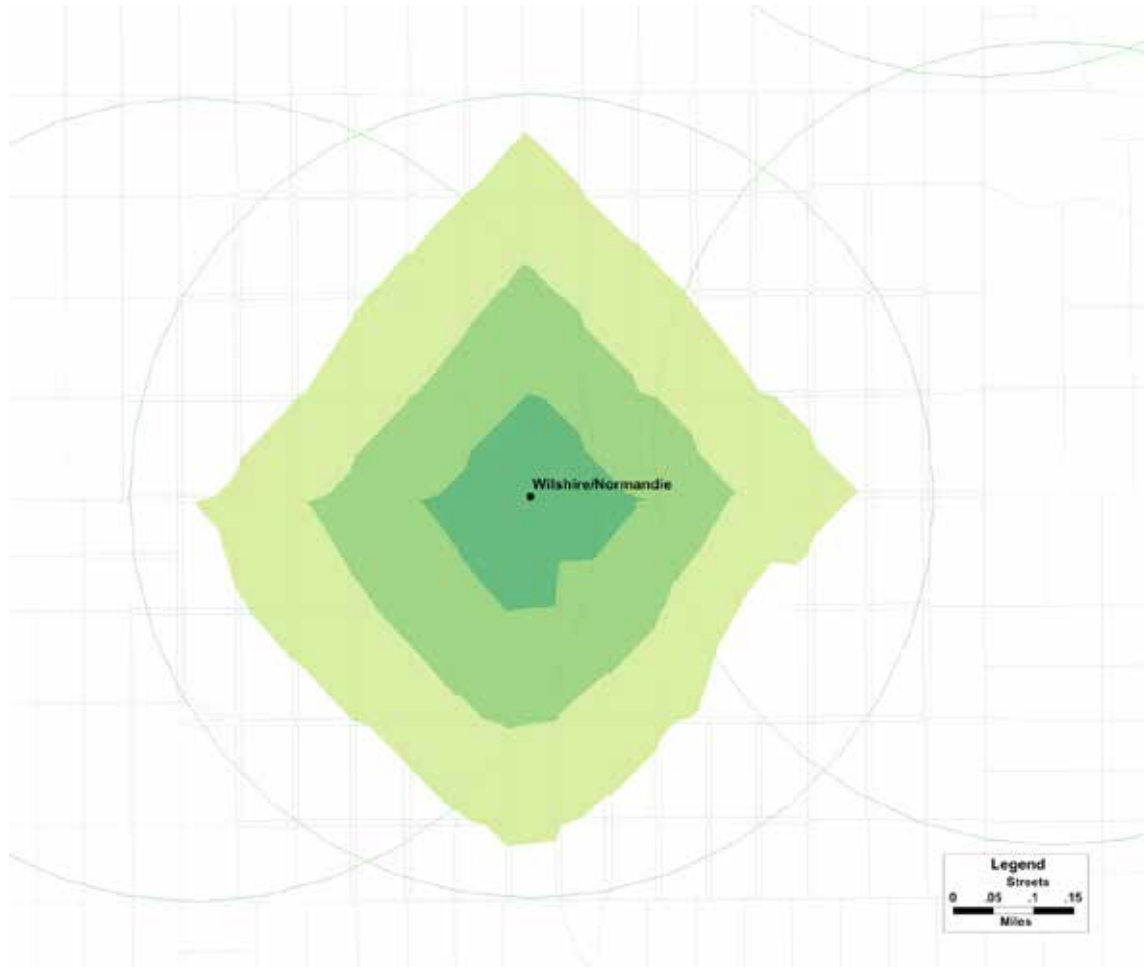
Figure 16 – Metro Path Concept – Wilshire/Normandie Station



It is important to notice that the stations are closely spaced, and that the benefits of the expansion of the shed towards the neighboring stations should be viewed with caution, as there is the potential of considering the benefit more than once. As the network is more consolidated, the changes to the network are not as noticeable as for the other two stations analyzed, and were limited to improvements at signalized intersections and crossings at Path Arterials. The changes in the shape of the access shed are shown in Figure 17.

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Figure 17 – Metro Path 15-minute walk access shed – Wilshire/Normandie Station



The changes proposed to the pedestrian network increased slightly the overall access to the station, and it is estimated that the population reached within a 15 minute walk increases about 2%, which could result in a forecast ridership increase of 55 boardings per day at the station. The ridership survey indicates that the Wilshire/Normandie is a station with a small number of transfers, with only 25% of the riders boarding the station from other transit lines. The anticipated potential increase in ridership given the change in accessibility to the station would be about 1.5% to 3%.

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Summary

The proposed methodology yields numerical results that are considered conservative, given that it does not capture behavioral changes relative to the qualitative improvements in the overall streetscape. This is an especially important feature for the older population, which has limited mobility when compared to adults and young adults. A study published by Daniel Baldwin Hess in the Journal of Transport and Land Use (<http://jtl.org/>) indicate that models estimate that in the City of San Jose, California, each additional 5 minutes in perceived walking time to transit decreases ridership frequency by 5% for non-drivers, and by 25% for drivers.

The potential to improve access varies by location (place type), but is also impacted by local configurations such as the street fabric and the location of the population and employment densities relative to the station. Caution should be exercised in areas of high station density (stations closer than 0.5 mile) in order to not double count the changes in socioeconomic data, which can lead to an overestimate of the potential new riders.



Appendix

Taxonomy of Mobility Devices



GREEN MODE-HUMAN POWERED-PEDESTRIAN-WALKING

Description & Trends

Walking is not only one of the best forms of exercise, but the most common mode of transportation. Urban planners have focused recent efforts on creating a built environment that allows people to walk; communities with pedestrian-friendly areas, and in some cases partially car-free, allow commuting, shopping, and recreation to be done by walking. Walking, alone, may not meet the needs of all trips, but it is easily combined with other active modes and public transit because it requires no additional facilities or amenities to transition into/out of.

As wheeled active and electric devices grow in popularity, maintaining a safe and comfortable environment for all types of walkers (leisurely shoppers, exercisers, commuters, etc.) will be increasingly important, as many of these other devices utilize sidewalks.

Multi-Modal Access

Walking is an integral part of most trips, and as the base mode of human movement will remain so. The infrastructure that supports this mode includes a range of associated facilities including; sidewalks, street crossings, lighting, signage, technology, landscaping and canopies to name a few. People are more likely to utilize transit if the urban environment is conducive to walking.

Average Speed*

3 mph

Range = 2 - 4 MPH

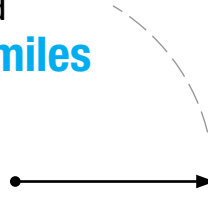
Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

0.5 miles



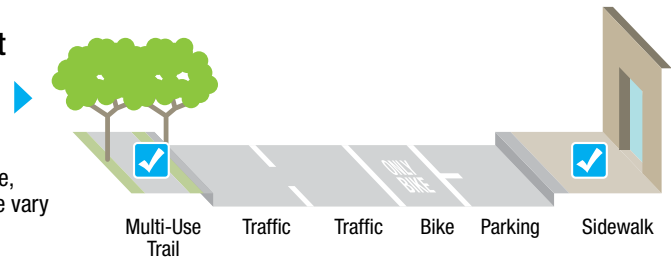
Energy Requirements**

Human powered:

90 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.

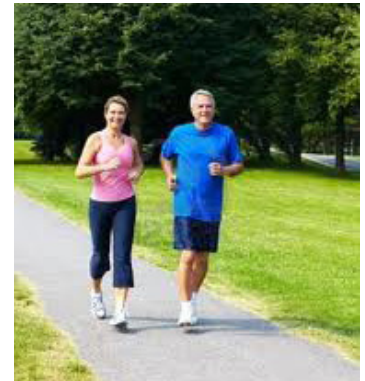


Demographics

Primary: All Ages

* <http://walking.about.com/library/cal/uccalc1.htm>

** Based on the National Center for Health Statistics average weight for adult males, in the United States, of 175 lbs. <http://walking.about.com/library/cal/uccalc1.htm>



GREEN MODE-HUMAN POWERED-PEDESTRIAN-JOGGING/RUNNING

Description & Trends

Typically, jogging/running is a competitive or fitness related activity, that can take place on popular pedestrian and bicycle routes, and therefore should be considered in the design of first/last mile connections. Theoretically, jogging/running for transportation is within the reach of more people than driving a car. It is cheaper than public transit, or purchasing a bicycle, but it is difficult to translate into a reality in some circumstances.

Multi-Modal Access

Like walking, transitioning between jogging/running and other modes of public transit is easy, due to the lack of equipment and facilities required; however, to make it feasible as a transportation option, commuters often have to identify alternative solutions, such as amenities (shower, lockers, etc.) at or near their destination.

Supporting third party programmatic elements such as fitness centers can help commuters fold their exercise routines into their commute and should be explored where possible. Some locations (such as remote low density commuter nodes) could even support integrated shower and changing facilities into the stations themselves.

Average Speed*

6 mph

Range = 5 - 12 mph

Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

1 mile

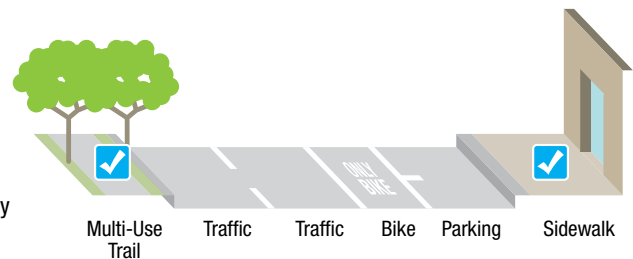
Energy Requirements**

Human powered:

130 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



Demographics

Primary: Teens/Adults 12-65 yrs.

Secondary: Adults/Seniors > 45 yrs.

* National Council on Strength & Fitness

** Based on the National Center for Health Statistics average weight for adults males, in the United States, of 175 lbs. <http://www.healthstatus.com/calculate/cbc>



GREEN MODE-HUMAN POWERED-PEDESTRIAN-PUSH/PULL

Description & Trends

Carts, strollers, and wheelchairs are common on today's sidewalks in urban and suburban environments. These devices are typically associated with critical daily functions, such as transporting groceries, babies, or the disabled. As these devices are wheeled, they require smooth and even rolling surfaces to be effectively used. As sidewalks become more crowded with new mobility devices, these devices which typically require larger spaces to operate become difficult to maneuver efficiently.

Multi-Modal Access

Wheelchairs, when being assisted by an individual, have been accounted for in the design of light rail and bus transit; however, the minimum clearance requirements at boarding and alighting points are not always met.

Furthermore, the varying sizes of strollers and hand carts (for groceries, laundry, freight, etc.) are a challenge to accommodate on busses and trains comfortably, alongside other commuters. Station access routes should be designed to accommodate the use of such devices and elevators, lifts and low incline ramps must be provided to assure easy access to platforms.

Average Speed*

3 mph

Range = 2 - 4 MPH

Dynamic Envelope

4ft

(Minimum width)

Average Ten Minute Access Shed

0.5 miles

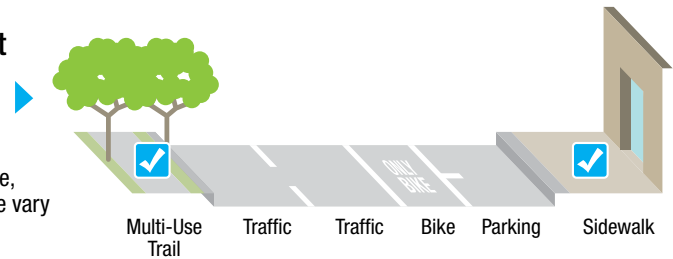
Energy Requirements**

Human powered:

90 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.

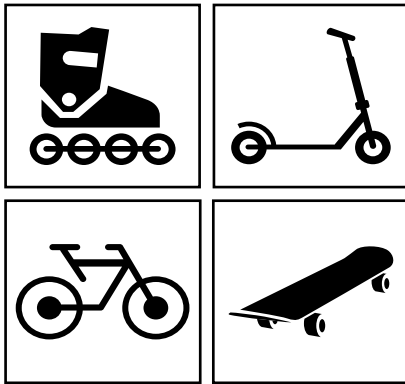


Demographics

Primary: Adults/Seniors

* <http://walking.about.com/library/cal/uccalc1.htm>

** Based on the National Center for Health Statistics average weight for adults males, in the United States, of 175 lbs. <http://walking.about.com/library/cal/uccalc1.htm>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-ADULT BICYCLES

Description & Trends

There is a vast range of bicycles including; mountain, BMX, utility, folding, road/race, recumbent, and hybrids that are utilized for commuter trips.

Bicyclists can achieve significant commute lengths in reasonable time frames, and if opportunities for showers, changing, and storage facilities are leveraged, that length can be increased even more. Bicycles are becoming an increasingly popular form of urban transportation. A survey of 55 major metropolitan areas in the U.S. found that bicycle commuting rates increased, on average, 70 percent between 2000 and 2009.

Multi-Modal Access

Bicycle transportation has received significant attention in recent years due to its potential to increase mobility, alleviate traffic congestion, reduce negative environmental impacts, and combat public health issues, but bicycle commuting still represents a small percentage of overall commuters. Better bicycle facilities are needed most notably on routes leading to transit nodes. Bike storage solutions are important as are strategies that allow bicyclists to bring their bikes with them on busses and trains. Ramps and lifts that can accommodate bikes are critical when making vertical transitions within stations.

Average Speed*

15 mph

Range = 9 - 20 mph

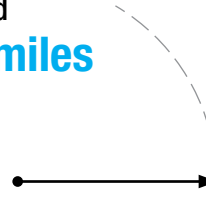
Dynamic Envelope

3ft - 4 ft

(Minimum width varies from bicycle - tricycles)

Average Ten Minute Access Shed

2.5 miles



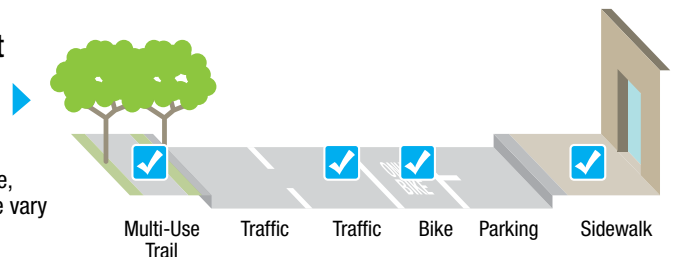
Energy Requirements**

Human powered:

55 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



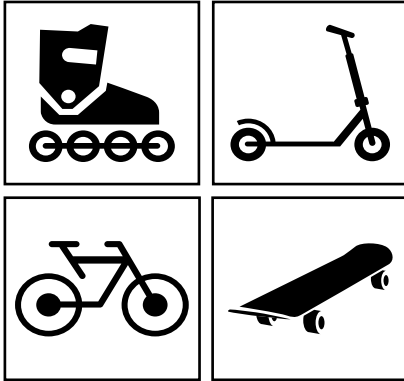
Demographics

Primary: Adults 25-65 yrs.

Secondary: Seniors > 65 yrs.

* The average bicycle speed used in commuter bike lanes, according to "Transportation Infrastructure and Engineering", by Lester A. Hoel.

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://www.healthstatus.com/calculate>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-CHILD BICYCLES

Description & Trends

Children's bicycles and tricycles are made of both steel and plastic frames. While typically used in suburban communities, children on bicycles and tricycles have become more common on sidewalks in urban environments, often commuting alongside parents and adults. The age of users being young, requires additional safety precautions, especially given the number of devices also used on sidewalks, and the range of speeds they will be mixed with.

Multi-Modal Access

The most important consideration to make when considering mobility infrastructure for children riding bikes, is they should not be expected to utilize bike facilities that are integrated with the vehicular roadway. Children's bicycles have the same functional requirements when considering access to transit as their adult counterparts, though they are typically too small (or the riders are too small) to be effectively mounted on bus racks. Accommodations should be made to allow the easy transition onto busses and trains especially when considering public transit offers a safe route to schools, and bikes help extend the associated access shed of students.

Average Speed*

7 mph

Range = 5 - 10 mph

Dynamic Envelope

2ft

(Minimum width)

Average Ten Minute Access Shed

1.25 miles

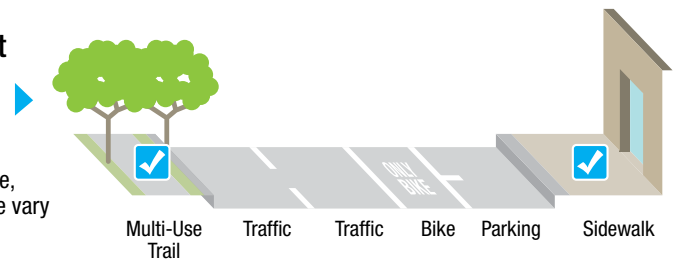
Energy Requirements**

Human powered:

40 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.

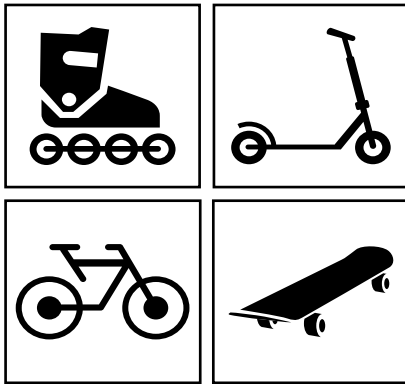


Demographics

Primary: Children 2-10 yrs.

* The average bicycle speed, according to "Transportation Infrastructure and Engineering", by Lester A. Hoel.

** Based on the maximum pediatric recommendations for weight of 10 year old, in the United States, of 100 lbs. This number reflects the high end of the demographics that typically use this device. <http://www.healthstatus.com/calculate>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-FREIGHT BICYCLES

Description & Trends

The modern evolution of the cargo-bike as personal transport began in Europe in the 1980s, with Holland and Denmark as epicenters; kid-and-grocery-carrying bakfiets (“box bike”) caught on with families. Urbanites and suburban dwellers are swept up in the cargo-bike cult, integrating bicycles into their daily lives. In Brooklyn, cargo-bikes have become the most fashionable means of delivering kids to school.

Freight bicycles come in many varieties including tricycle and tandem style, and store cargo on open platforms, built-in cargo cases, open buckets, and often times homemade contraptions for securing freight.

Multi-Modal Access

While freight bicycles are not typically used as a part of a longer commute, they are a growing trend used for both residents (running errands, transporting children) and businesses (delivering food, mail, and other goods) that will require special consideration to fit into the larger mobility puzzle. Their larger spatial requirements may need special bicycles lockers and parking to keep from over capacitating existing bicycle infrastructure.

Average Speed*

12.5 mph

Range = 9 - 20 mph

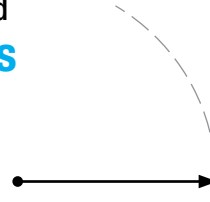
Dynamic Envelope

4 ft

(Minimum width)

Average Ten Minute Access Shed

2 miles



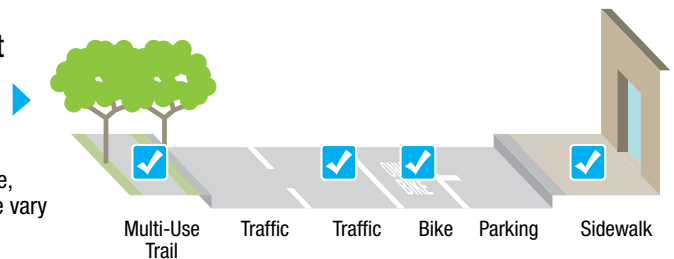
Energy Requirements**

Human powered:

90 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



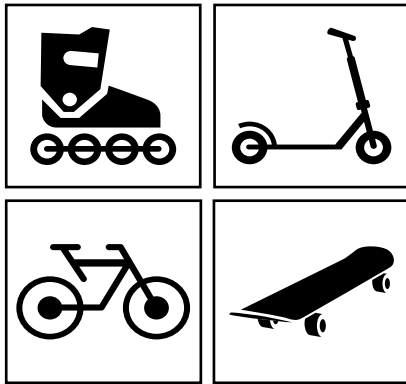
Demographics

Primary: Adults 25-65 yrs.

Secondary: Teens/Young Adults 12-25 yrs.

* <http://bikes-as-transportation.com>

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs.- weight was multiplied by a factor of 1.5 to account for freight. <http://www.healthstatus.com/calculate>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-WHEELED SHOES

Description & Trends

Heely's were patented in late 2000, and are the most common brand of roller shoes sold in the U.S. (followed by Street Gliders, a similar product that attaches to regular shoes). After becoming popular in Korea, Singapore, and Europe, Heely's, Inc. shipped over 10 million pairs to the U.S. between 2000 and 2007, with sales tripling from 2005-2006. In 2007 sales fell drastically, and roller shoes remain a blip in the market of alternative mobility devices.

An important aspect to consider when considering this mobility device, is the fact that the millions of pairs that have been sold in the U.S. have almost exclusively been sold to today's youth. This suggests a demographic that is being exposed to an alternative mobility device at a young age, and reflects a desire and willingness to use such new devices. As this demographic group ages, it is expected they will continue to do so.

Multi-Modal Access

If Heely style devices became a larger part of the market, they could contribute to pedestrians' commuters' ease and time efficiency, and expand the distance that can be covered comfortably. And as a device that is integrated with shoes, they essentially have no spatial impact on existing infrastructure.

Average Speed*

4 mph

Range = 3 - 6 mph

Dynamic Envelope

3ft

(Minimum width varies from bicycle - tricycles)

Average Ten Minute Access Shed

.65 miles

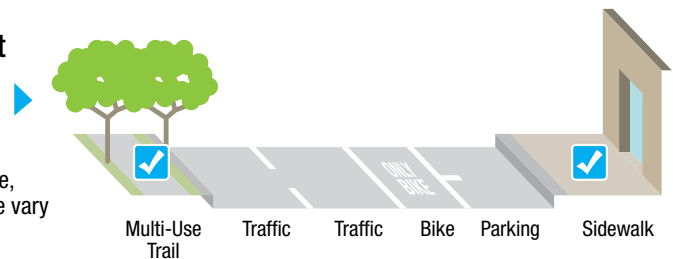
Energy Requirements**

Human powered:

70 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



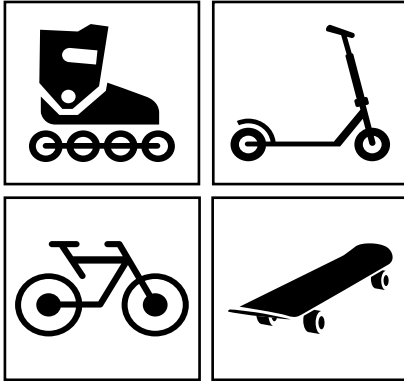
Demographics

Primary: Children/Teens 6-15 yrs.

Secondary: Young Adults 16-20 yrs.

* Recommended safe speeds from manufacturers: Heely

** Based on the maximum pediatric recommendations for weight of 14-15 year old, in the United States, of 125 lbs. This number reflects the high end of the demographics that typically use this device. <http://www.healthstatus.com/calculate>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-ROLLER SKATES

Description & Trends

First patented in 1760, and later reinvented in 1863, Roller skates hit its popularity peak during the disco era, later tapering off in the 1980s and 90s. From speed skating, to roller derby, to Roller skating even making an appearance in the Olympics in 2012, Roller skates are enjoyed today both as a pastime and in competitive sports.

Roller skates are not typically used for commuting, partially due to the speed limitations they face when not on perfectly smooth surfaces, such as new pavement. The width required to build up proper momentum, through the skating motion, is larger than roller blades, because of the larger 4-wheeled base, causing more conflicts on sidewalks where pedestrians and others modes are operating as well.

Multi-Modal Access

The restrictions of roller skates have been addressed through inline skates and roller blades, making them a less likely choice for urban commuters. If utilized as a part of a longer commute, their size makes them easily transported on and off of buses and light rail.

Average Speed*

3 mph

Range = 3-6 mph

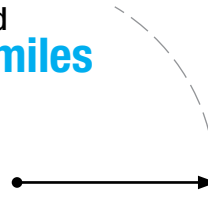
Dynamic Envelope

4-5 ft

(Minimum width/skate-like motion)

Average Ten Minute Access Shed

0.5 miles



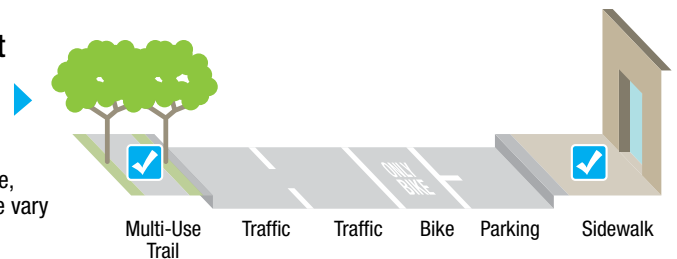
Energy Requirements**

Human powered:

120 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



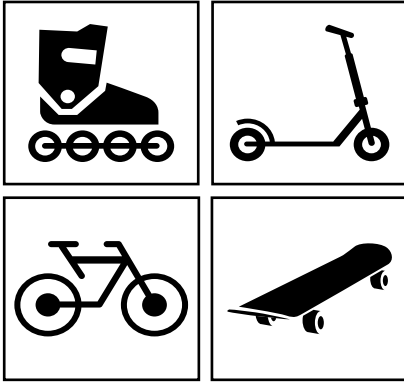
Demographics

Primary: Children/Teens 8-18 yrs.

Secondary: Adults 18-35 yrs.

* <http://www.livestrong.com/>

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://www.livestrong.com/>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-ROLLER BLADES

Description & Trends

From the beginning of Roller blade, Inc. in 1984, the inline skating industry has grown to encompass over 30 million participants (as of 1996) and several hundred companies that manufacture a wide variety of skates, safety gear, and other inline merchandise.

According to the International Inline Skating Association (IISA), inline skating participation has increased 630% since 1989, and was the fastest growing sport in the United States in 1996. Although the rate of increase declined slightly in 1997, the sport itself continues to spread and diversify. Manufacturers offer an increasing range of specialized skates, including inline hockey skates, speed skates, aggressive skates, and skates designed specifically for women and fitness skaters.

Multi-Modal Access

Aside from weather conditions, roller blades, while not currently an extremely common choice, do not face many challenges as a commuter mode. They are able to negotiate most surface conditions, except for major potholes, and have a quick breaking/reaction time for maneuvering crowded sidewalks. Expert skaters can utilize them in bike lanes and on multi-use paths at speeds similar to commuter bicyclists. Their size makes them easy to transport on and off of light rail and buses as part of a larger commute length.

Average Speed*

14 mph

Range = 10-20 mph

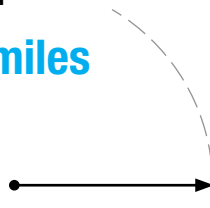
Dynamic Envelope

4 ft

(Minimum width/skate-like motion)

Average Ten Minute Access Shed

2.3 miles



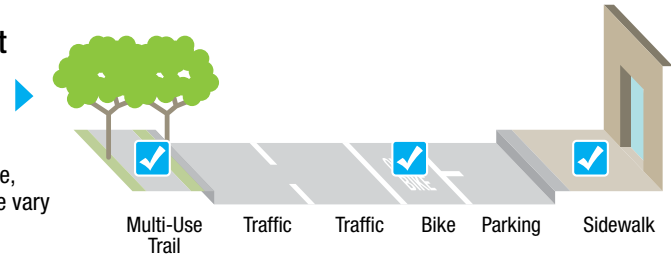
Energy Requirements**

Human powered:

75 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



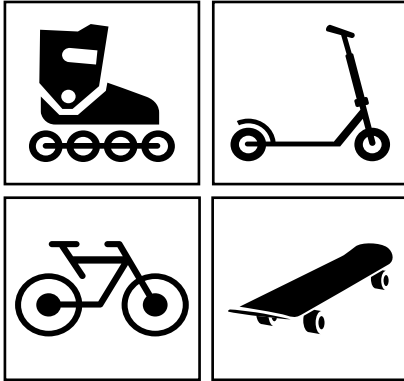
Demographics

Primary: Adults 25-45 yrs.

Secondary: Teens/Young Adults 12-15 yrs.

* <http://www.livestrong.com/>

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://www.livestrong.com/>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-KICK SCOOTER

Description & Trends

The foldable aluminum scooter that uses inline skate wheels was created in 1996 by Wim Ouboter, in Switzerland. The first Razor scooter was distributed by The Sharper Image in 1999 (Japan) and became extremely popular in 2000 in the U.S. It was designed as a portable transporter, but is primarily used as a toy for children.

The U.S. marketers of Razor scooter, in California, sell more than 3 million scooters each year. The wheels of kick-scooters are small and they have very low clearances, making sidewalks with potholes, and high curbs difficult to maneuver. Some brands provide limited breaking capabilities; however, many require foot breaking, or dismounting to fully stop.

Multi-Modal Access

Much like children's' bicycles, kick scooters are often used in suburban neighborhoods, where vehicle traffic is slower and there are fewer pedestrians, and they are often observed on routes to school, or alongside parent/adult commuters. Kick scooters low cost and ability to fold up quickly make them a seamless device when transferring between transit modes.

The greatly increased speed of kick-scooters can cause safety concerns on sidewalks, and the young age of most riders precludes the notion of relegating their use to roadway located bike facilities.

Average Speed*

5 mph

Range = 10 mph

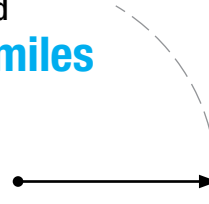
Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

0.8 miles



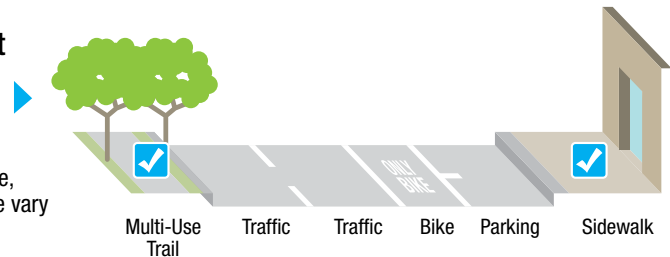
Energy Requirements**

Human powered:

35 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



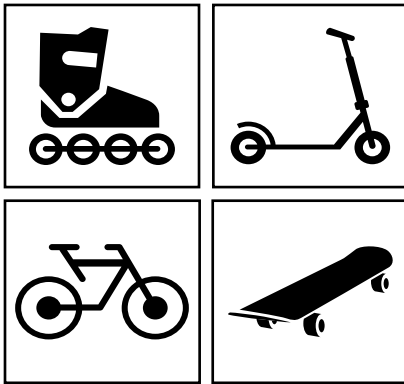
Demographics

Primary: Children < 12 yrs.

Secondary: Teens/Young Adults 13-22 yrs.

* <http://www.nycewheels.com/>

** Based on the maximum pediatric recommendations for weight of 10 year old, in the United States, of 100 lbs. This number reflects the high end of the demographics that typically use this device. <http://www.healthstatus.com/calculate>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-ADULT SCOOTER

Description & Trends

Push scooters for adults have become popular in the last several years, as active transportation is on the rise in urban environments. They are marketed as “opportunistic” devices that can be used on both roads and footpaths depending on traffic conditions. In 2010 sales in New York City made up 45% of all sales for Xootr, one of the largest manufacturers of adult scooters, up from 35% in 2009. As the trend of adults riding scooters continues to grow with more adults commuting to work, parents scooting with their kids, and college students riding to class, Razor scooter, the popular childrens’ brand, has introduced scooters for adult riders with larger wheels, deck and weight limits. As a market that grew out of a childrens’ device, they are most commonly used on sidewalks; however, the adult versions can reach much faster speeds and interfere with pedestrian traffic and slower modes that require sidewalks.

Multi-Modal Access

While the folding childrens’ and smaller adult scooters can be carried on and off transit, the larger models require little additional infrastructure such as bicycle locking racks or lockers for storage.

Average Speed*

10 mph

Range = 5-20 mph

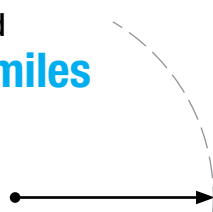
Dynamic Envelope

2 ft

(Minimum width)

Average Ten Minute Access Shed

1.6 miles



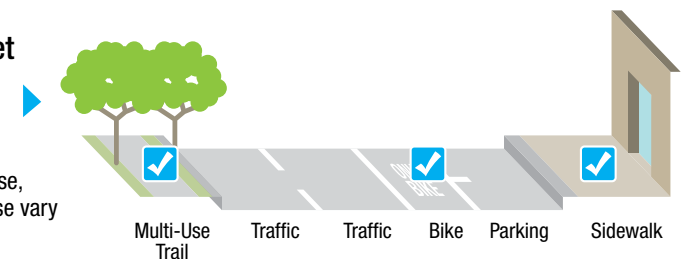
Energy Requirements**

Human powered:

90 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



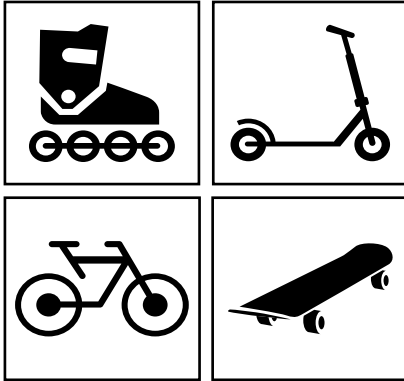
Demographics

Primary: Teens/Young Adults 16-35 yrs.

Secondary: Adults 35-50 yrs.

* <http://www.nycewheels.com/>

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://www.livestrong.com/>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-SKATEBOARD

Description & Trends

Skateboarding started in the 1950's when Californian surfers got the idea of trying to surf the streets. It reached the peak of popularity in 1963, but crashed in 1965 and disappeared like many fads. When the urethane skateboard wheels used today were invented in 1972, new interest in skateboarding amongst surfers and other youth took an evolutionary step toward the sport we see today. It took several ups and downs in popularity through the 80's, but remained an underground sport until its inception into the mainstream in the early 90's.

Since 2000, skateboarding has become commercialized and sold as a commuter alternative, with many variations and styles on the market. For commuters, long-boarding is the style most common, because of the greater stability, traction, and durability. Long-boards include features that allow easier lifting to maneuver over bumps, cracks, and obstacles.

Multi-Modal Access

Skateboards and long-boards can achieve relatively high speeds, while being small enough to easily carry on and off transit, and store without additional infrastructure such as locking racks. This mode also requires less effort to operate, making shower and changing facilities less necessary for commuters.

Average Speed*

8 mph

Range = 6-18 mph

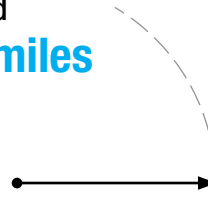
Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

1.3 miles



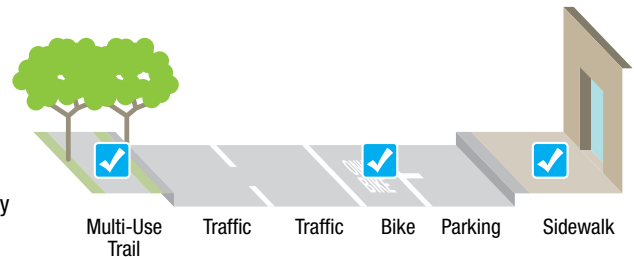
Energy Requirements**

Human powered:

60 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



Demographics

Primary: Teens 12-18 yrs.

Secondary: Young Adults 18-30 yrs.

* <http://www.livestrong.com/>

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://www.livestrong.com/>



GREEN MODE-HUMAN POWERED-ACTIVE TRANSPORTATION-INNOVATIONS

Description & Trends

The Elliptigo is a derivative of both a stationary elliptical trainer and a bicycle. While reducing the amount of impact your body sustains. Everyday fitness enthusiasts have turned to the elliptigo in place of bicycles and running for exercise, recreation, and small trips. The elliptigo offers a commute option for those uncomfortable with bicycling; the standing position provides added safety with less resistance to stop and go, being at eye level with pedestrians, and less balance required to operate.

The Trikke is a new mobility device, very similar to the Elliptigo with a few varying features. Trikkies do not use two inline wheels, rather 3-wheels, hinged like a tricycle. The trikke can fold small enough to fit in a car or under a desk, making it a practical option for commuting or as part of a larger commute trip (to be carried). Unlike the elliptigo, trikkies require more balance and skill to learn to operate, and cannot function on unsmooth surfaces. They attain similar speeds, with low impact.

Multi-Modal Access

Both of these emerging innovations are bulky and would be difficult to integrate directly on rolling stock (bus or train) but could be accommodated at stations through provision of lockable storage. These devices reflect an on-going interest in new modes of active transportation that combine exercise with commuting.

Average Speed*

12 mph

Range = 10 - 17 mph

Dynamic Envelope

4-8 ft

(Minimum width)

Average Ten Minute Access Shed

2 miles

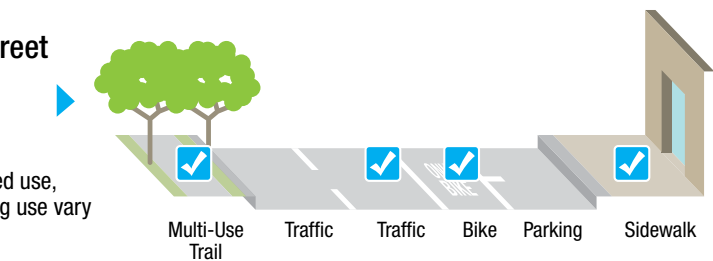
Energy Requirements**

Human powered:

40 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



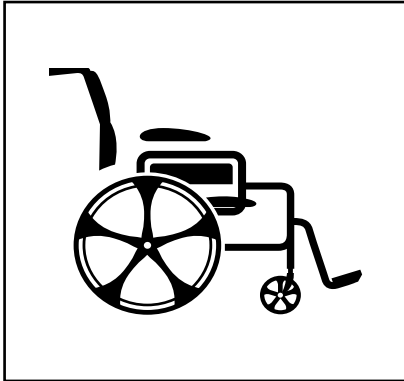
Demographics

Primary: Adults 25-65 yrs.

Secondary: Teens/Young Adults 12-25 yrs.

* www.commutebybike.com

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://www.trikketampastore.com>



GREEN MODE-HUMAN POWERED-UNIVERSAL ACCESS DEVICE-CANE

Description & Trends

A cane (or walking stick) is a device most commonly used to help a person with a disability balance while walking, similar to a crutch. They are typically used as a mobility or stability aide, in the opposite hand of the injury or weakness.

Canes help redistribute weight from the lower leg that is weak or painful, improve stability by increasing the base of support, and provide tactile information about the ground to improve balance. Ten percent of adults older than 65 use canes, a much larger group than those using walkers.

Multi-Modal Access

Along with the demographic of users requiring additional safety precautions, especially amongst faster mobility devices being operated on sidewalks, facilities such as drop off sites, and ADA compliant designs at transit stations should be updated to accommodate the growing population of those using canes.

Mobility infrastructure must consider the slower speeds of pedestrians using canes, especially at street crossings. Tiered signalization programs that allow for longer crossing times should be considered along transit access routes.

Average Speed*

2 mph

Range = 1-3 mph

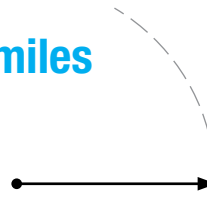
Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

0.3 miles



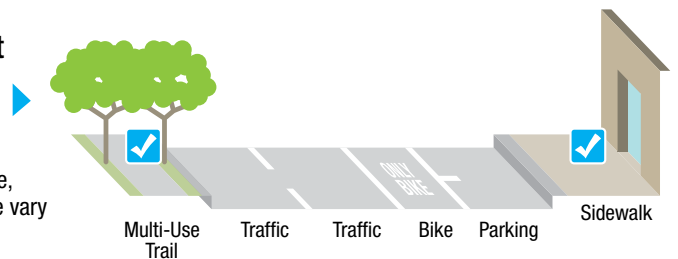
Energy Requirements**

Human powered:

80 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



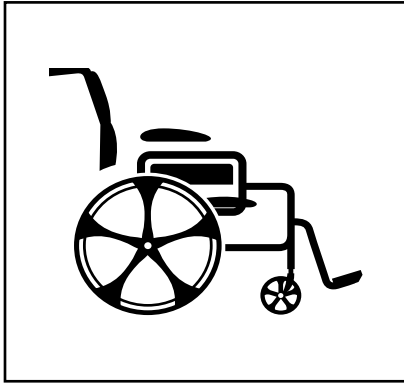
Demographics

Primary: Seniors 65+ yrs.

Secondary: All ages with injuries or disabilities.

* www.livestrong.com

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://walking.about.com/library/cal/uccalc1.htm>



GREEN MODE-HUMAN POWERED-UNIVERSAL ACCESS DEVICE-CRUTCHES

Description & Trends

Crutches are used as a mobility aid when a person has an injury or impairment to a leg(s) and cannot fully support one's weight. They come in several types; such as forearm, underarm, strutters, platform, and leg support, and have more load bearing capacity than canes or lift walkers.

Crutches offer a larger variation of gait patterns for movement; however, they require more work to utilize and are typically used for younger people with mobility needs. Facilities such as drop off sites should be provided for those temporarily bound to crutches during their commute.

Multi-Modal Access

ADA compliant transit facilities and appropriate seating on light rail and bus transit should be provided to ensure efficient commuting. Those using crutches typically make up a younger population than canes and wheelchairs, but there are still challenges for long commutes as the energy requirements are quite high.

Tiered signalization programs that allow for longer crossing times should be considered along transit access routes.

Average Speed*

1 mph

Range = 1-2 mph

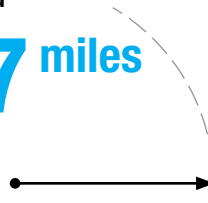
Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

0.17 miles



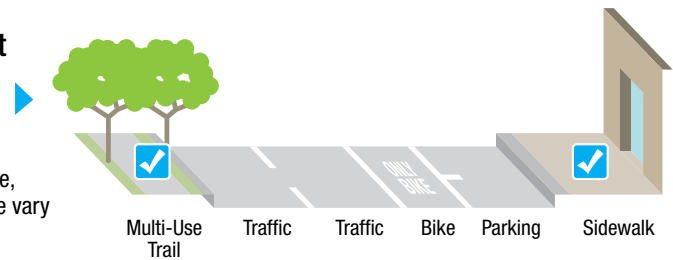
Energy Requirements**

Human powered:

400 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.

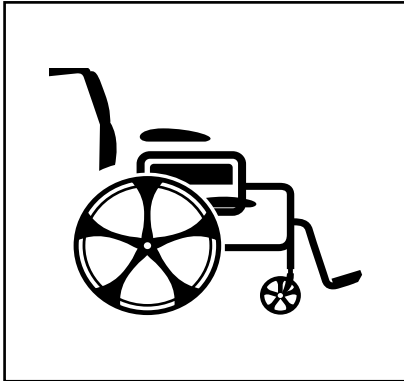


Demographics

Primary: All Ages

* www.livestrong.com

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. www.livestrong.com



GREEN MODE-HUMAN POWERED-UNIVERSAL ACCESS DEVICE-WHEELCHAIR

Description & Trends

The wheelchair originated from England in the 1670s to assist in transporting people with walking disabilities. The standard wheelchair has a seat, a back, two small front wheels, two large wheels, and a footrest. Recently, various accessories have become available for wheelchairs, such as seat belts, adjustable back rests, pouches, and cup holders to offer more freedom to the users.

Many still prefer to use manual wheelchairs, even with the advent of electric powered devices. Many wheelchair users are only temporarily in need of assistance and can get around easily in a manual wheelchair for a short period of time: however, the main factor in determining to use manual chairs for most people is cost.

Multi-Modal Access

Most public transportation stations, trains, and buses are accommodating to manual wheelchair users; however, they have historically been treated as an isolated group, with limited number of spaces on buses. As the population ages and more manual and electric wheelchair users ride public transit, new seating configurations and storage may be required.

Sidewalks and routes to transit nodes must maintain smooth and clear rolling surfaces, accessible curb ramps, and signal times conducive to safe street crossings.

Average Speed*

3 mph

Range = 2-4 mph

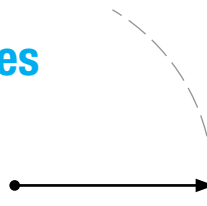
Dynamic Envelope

4 ft

(Minimum width)

Average Ten Minute Access Shed

.5 miles

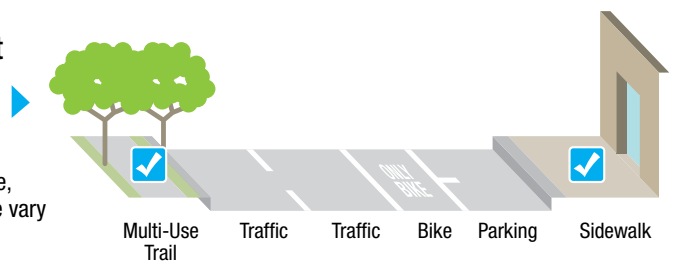


Energy Requirements* *

Human Powered:
120 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



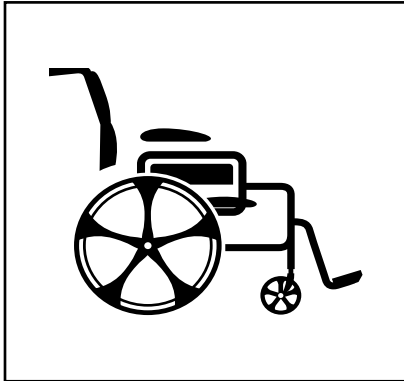
Demographics

Primary: Teens/Adults 16-40 yrs.

Secondary: All ages with injuries or disabilities.

* <http://www.wheelchairs.com/index.htm>

* * Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://www.utk.edu/tnto-day/2011/10/28/wheelchair-exercise-calorie-burning/>



GREEN MODE-HUMAN POWERED-UNIVERSAL ACCESS DEVICE-LIFT WALKER

Description & Trends

First appearing in the 1950s and later patented in the U.S. in 1953. A walker, or “Zimmer Frame”, is a tool designed to support disabled or elderly people while walking. Both easy to use and easy to store, the walker is the alternative choice to a cane when a person needs assistance keeping balance while walking.

While having few disadvantages, the walker does require the patient lift the walker every step, thus slowing down a patient's stride.

Multi-Modal Access

Along with the facilities provided for other access devices, such as drop-off sites and ADA compliant transit stations, the lift walker takes up additional space on light rail and bus transit, additional storage may be required. As the population of those requiring assisted devices grows, the lift walker remains one of the slower modes.

Tiered signalization programs that allow for longer crossing times should be considered along transit access routes.

Average Speed*

1 mph

Range = 1-4 mph

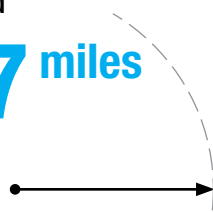
Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

0.17 miles



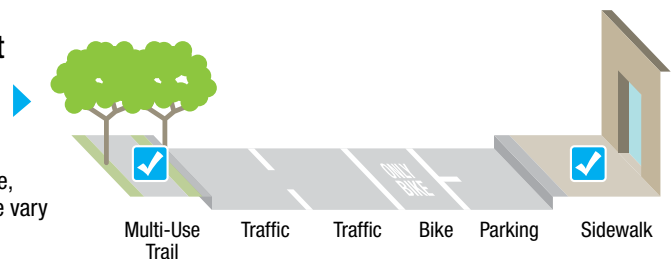
Energy Requirements**

Human powered:

40 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



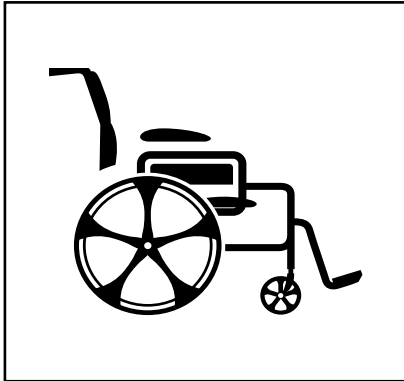
Demographics

Primary: Seniors 65+ yrs.

Secondary: All ages with injuries or disabilities.

* www.livestrong.com

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://walking.about.com/library/cal/uccal1.htm>



GREEN MODE-HUMAN POWERED-UNIVERSAL ACCESS DEVICE-WHEELED WALKER

Description & Trends

Serving as an alternative to a traditional walker, the rolling walker is easier to operate and provides additional comfort to the user; however, the small wheels are not suited for use on grass or paved surfaces with obstructions. The small wheels can also cause the wheeled walkers to be less stable than lift walkers, but alleviate the lifting for those with additional disabilities/needs.

The wheeled walker comes in several variations, the front-wheeled walker is most similar to the lift walker, with two small wheels to make movement smoother. The rollators, are a later variation of wheeled walkers, with four wheels, hand brakes, and a built-in seat (often a basket is also included). Rollators allow the user to stop and rest when needed, and have more adjustable features such as height. Braking on the handlebars allows for immediate stopping and for maneuvering the rollator by braking one side making the turning radius much tighter.

Multi-Modal Access

Similar drop off, ADA compliant, and storage facilities are required in transit stations and on light rail and bus transit, as for typical walkers.

Sidewalks and routes to transit nodes must maintain smooth and clear rolling surfaces, accessible curb ramps, and signal times conducive to safe street crossings.

Average Speed*

2 mph

Range = 1-5 mph

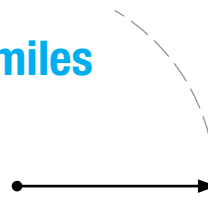
Dynamic Envelope

2.5 ft

(Minimum width)

Average Ten Minute Access Shed

0.3 miles



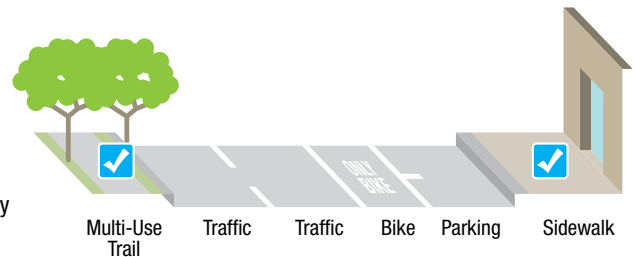
Energy Requirements**

Human powered:

80 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



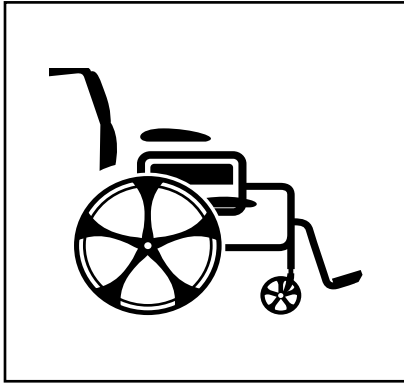
Demographics

Primary: Seniors 65+ yrs.

Secondary: All ages with injuries or disabilities.

* www.livestrong.com

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://walking.about.com/library/cal/uccal1.htm>



GREEN MODE-HUMAN POWERED-UNIVERSAL ACCESS DEVICE-WHITE CANE

Description & Trends

White canes are used by those who are blind or visually impaired as a mobility tool. There are several variations and lengths of white canes, but the primary purpose of each is to scan for curbs and steps, make others aware of the bearer's visual impairment, and offer balance, support or stability.

Techniques used to navigate with a white cane include synchronized tapping and stepping, and two-point touch techniques, which traditionally have provided enough information to the user about the immediate environment to make safe move decisions.

The use of a white cane does not account for abruptly approaching devices and erratic movements, a concern given the growing number of faster moving mobility devices observed on sidewalks.

Multi-Modal Access

Alterations to traffic signals and transit facilities, such as bus arrival notifications, require noise enhancements to account for the visually impaired. Routes to transit nodes will benefit from the use of tactile wayfinding strategies.

Average Speed*

2 mph

Range = 1-3 mph

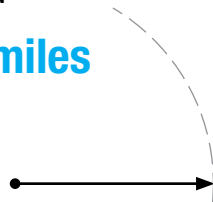
Dynamic Envelope

4 ft

(Minimum width)

Average Ten Minute Access Shed

0.3 miles



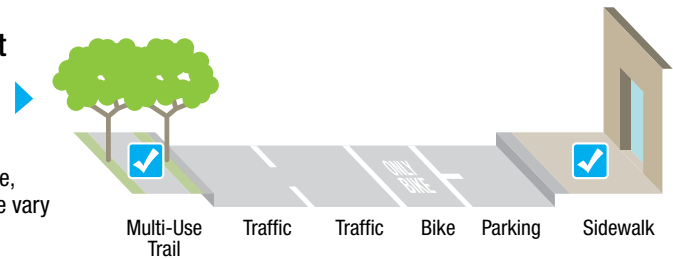
Energy Requirements**

Human powered:

80 cal/mi

Observed Street Use

Presents observed use, policies governing use vary by municipality.



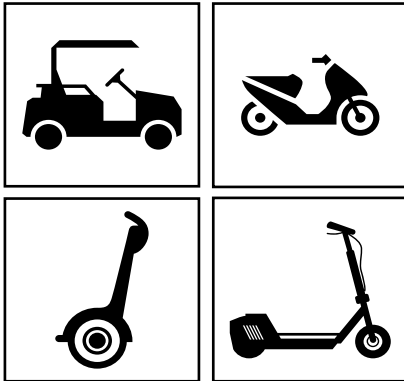
Demographics

Primary: Visually Impaired

(All Ages)

* <http://www.nfbnj.org/mobility.php>

** Based on the National Center for Health Statistics average weight for adults, in the United States, of 175 lbs. <http://walking.about.com/library/cal/uccalc1.htm>



GREEN MODE-ELECTRIC-NEIGHBORHOOD ELECTRIC VEHICLES

Description & Trends

Neighborhood electric vehicles (NEVs), refer to battery electric vehicles that are operated on roads that have speed limits up to 35 mph. In the United States, they fall under the legal categorization of low-speed vehicles.

Golf carts are a sub-category of NEVs, originally built to carry 2 golfers and their clubs, but with the price of gasoline skyrocketing, electric golf carts have become a green and convenient alternative mode of transportation for short trips.

Whole communities have been built around golf cart and NEV transportation. With more of them hitting the market for transportation use each year, the safety concerns have encouraged many cities to begin introducing golf carts and NEVs into their vehicle codes.

Multi-Modal Access

Transit stations/hubs and urban infrastructure will need to re-evaluate design guidelines for parking and charging stations as NEVs continue to grow as a commuter device due to rising gas prices, an aging population, and their low priced batteries, when compared to other electric devices on the market.

Average Speed*

30mph

Maximum = 45 mph

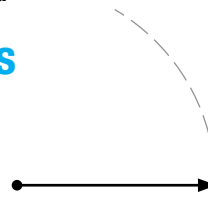
Dynamic Envelope

6ft

(Minimum width)

Average Ten Minute Access Shed

6 miles



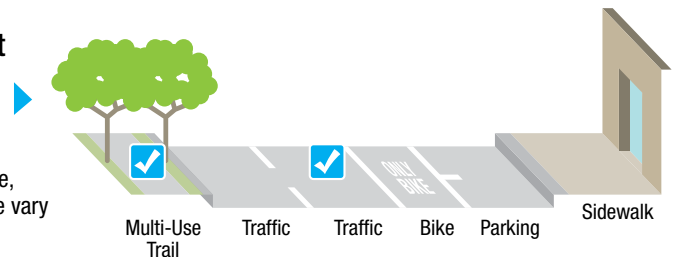
Energy Requirements

Battery powered:
Approximately 30 miles/charge (varies)



Observed Street Use

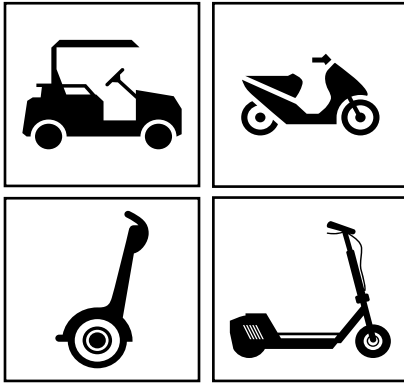
Presents observed use, policies governing use vary by municipality.



Demographics

Primary: Adults 18+ yrs.

* <http://www.pikeresearch.com/research/neighborhood-electric-vehicles>



GREEN MODE-ELECTRIC-ELECTRIC BICYCLE

Description & Trends

The Power-Assisted Bicycle is an emerging form of transportation that attempts to merge the health and environmental benefits of a bicycle with the convenience of a motorized vehicle. The environmental impact of an electric bike is more favorable than cars, busses, or other forms of urban transit.

Electric bicycle usage worldwide has experienced rapid growth since 1998. It is estimated that there were roughly 120 million e-bikes in China as of early 2010 and over 700,000 electric bicycles were sold in Europe in the same year.

Multi-Modal Access

E-bikes are not considered motor vehicles by the federal government and are subject to the same consumer safety laws as unassisted bicycles; because of this, they often operated on sidewalks and in bike lanes, even though they achieve speeds similar to car traffic on many urban roadways. They have similar dimensions as regular commuter bikes, and can be stored at transit facilities with basic bicycle lockers and locking racks. Charging facilities could be added at stations to help strengthen the link between their use to access transit.

Average Speed*

15 mph

Maximum = 25 mph

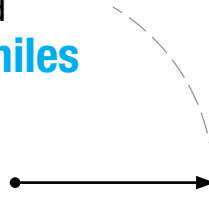
Dynamic Envelope

3ft

(Minimum width)

Average Ten Minute Access Shed

2.5 miles



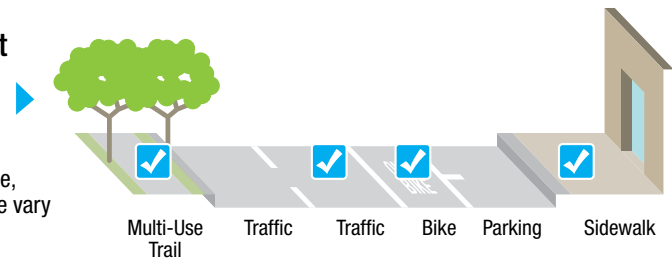
Energy Requirements

Battery powered:
1 amp hour/mile
(10-20 miles/charge)



Observed Street Use

Presents observed use, policies governing use vary by municipality.

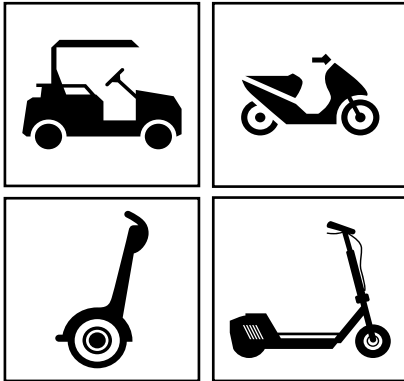


Demographics

Primary: Adults 18-65 yrs.

Secondary: Teens/Young Adults 12- 18 yrs.

* <http://www.electric-bicycle-guide.com/>



GREEN MODE-ELECTRIC-ELECTRIC SCOOTER

Description & Trends

Electric kick scooters have small platforms with two wheels, and are propelled by an electric motor, alongside human propulsion (pushing off the ground). The most common, have two hard small wheels, and are aluminum folding scooters much like the popular Razor kick scooters for children.

While they can attain similar speeds to electric bicycles and urban area car traffic, they are less safe to operate in the vehicle right of way, especially given the assisted propelling method of achieving such speeds.

Multi-Modal Access

E-scooters are amongst newly popular mobility devices that do not have a safe operating area, as they are too fast for sidewalks and have limited breaking/maneuvering around pedestrians. They also have rather small wheels, which makes them difficult to operate on surfaces with any obstructions. They can be locked to bicycles racks and stored in lockers at transit stations, but charging may be required as they have limited battery life.

Average Speed*

15 mph

Maximum = 20 mph

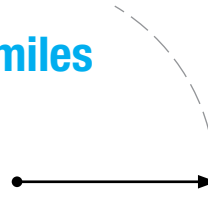
Dynamic Envelope

2ft

(Minimum width)

Average Ten Minute Access Shed

2.5 miles



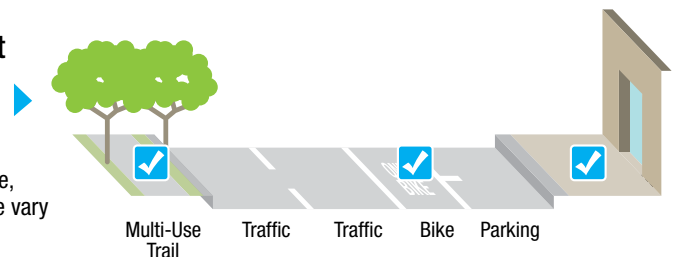
Energy Requirements

Battery powered:
17 watt/mile
(Assisted propelling)



Observed Street Use

Presents observed use, policies governing use vary by municipality.

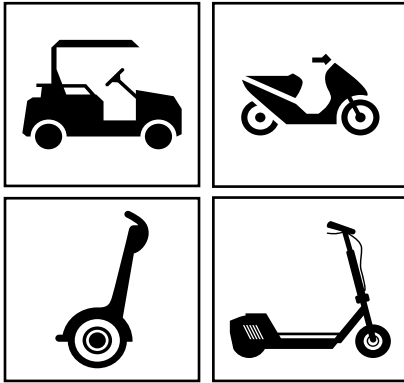


Demographics

Primary: Adults 25-40 yrs.

Secondary: Children/Young Adults 6-25 yrs.

* www.trendtimes.com/electric-scooters



GREEN MODE-ELECTRIC-ELECTRIC SKATEBOARD

Description & Trends

Electric skateboards are modified to be propelled by an electric engine, controlled by a remote that the user holds in their hand. Originally designed for local transport, there are versions with larger wheels that allow for traversing grass, gravel, dirt, and sand to make them functional in many environments.

Unlike scooters, they do require the skills for operating a skateboard (turning, foot breaking, etc.) and are more difficult to learn to operate. They reach higher speeds than is safe to be operated on sidewalks amongst pedestrians, but only experienced riders should utilize them on bicycle paths and shared roadways.

Electric skateboards are a reflection of the increased efficiency and reduced price of electric motors, and the fact that just about all human powered electric devices can be electrified.

Multi-Modal Access

Much like typical skateboards, they are lightweight and easy to store, making them a good device to transition between transit modes.

Average Speed*

15 mph

Maximum = 25 mph

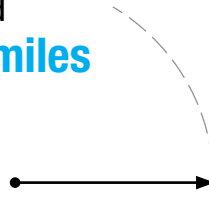
Dynamic Envelope

2ft

(Minimum width)

Average Ten Minute Access Shed

2.5 miles



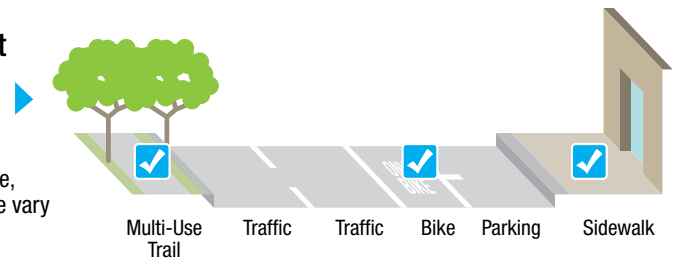
Energy Requirements

Battery powered:
800 watt/mile (9-12 miles per charge)



Observed Street Use

Presents observed use, policies governing use vary by municipality.

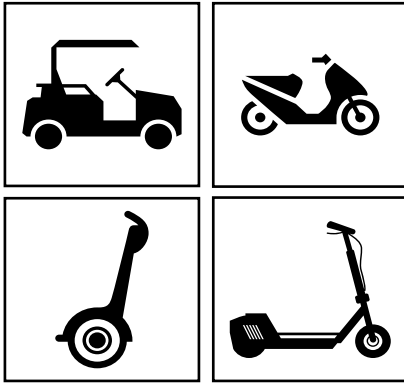


Demographics

Primary: Young Adults 16-25 yrs.

Secondary: Teens/Young Adults 25-40 yrs.

* www.electricskateboardreview.com



GREEN MODE-ELECTRIC-GYROSCOPIC DEVICES

Description & Trends

The electric Segway (the most common brand of gyroscopic devices) is a personal transporter (PT), designed to be used by an individual as an eco-friendly mode of transportation. The self balancing nature of gyroscopic devices, makes them easy to learn to operate and generally more safe than many other wheeled devices. Segways decrease risks additionally, by slowing and stopping when the operator is not on the devices.

Segways are used for a variety of purposes; tourists, police forces, postal service, and other small delivery companies began the trend of Segway use in the United States. The company that created Segways has challenged sidewalk bans throughout the United States, and have won in all but few municipalities to allow their use on sidewalks and in public transportation because of their classification as a medical device.

Multi-Modal Access

More popular for recreation currently, they are beginning to grow in use by commuters. As part of a larger commute, new designs for charging stations, lockers, or storage may be needed to accommodate the larger size and shape of gyroscopic devices.

Average Speed*

6 mph

Range = 3-12 mph

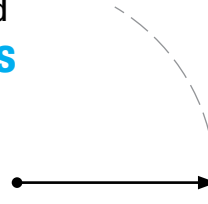
Dynamic Envelope

2ft

(Minimum width)

Average Ten Minute Access Shed

1 miles



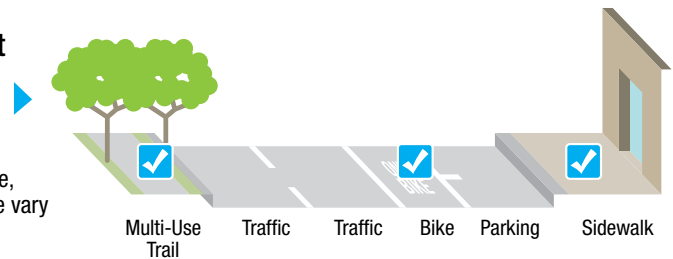
Energy Requirements

Battery powered:
12 miles/charge



Observed Street Use

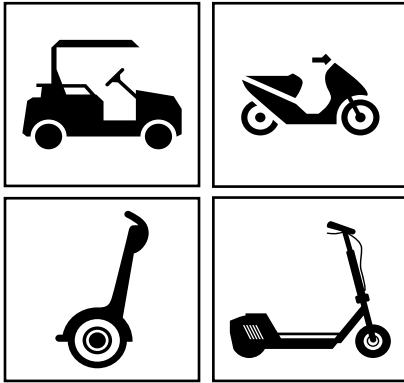
Presents observed use, policies governing use vary by municipality.



Demographics

Primary: Adults/Seniors 41+ yrs.

* www.segway.com/support/FAQs



GREEN MODE-ELECTRIC-MOBILITY SCOOTER

Description & Trends

Since 1990 the number of people using wheeled mobility devices has increased specifically in the mobility scooter sector; however, the unmet need for assisted technology devices is still substantial. The cost of mobility scooters (ranging from \$1000-\$20,000) is quite high given that only 18% of users ages 16-64 are employed.

Relying on mobility scooters for transportation is a growing trend, because the benefits outweigh those of electric wheelchairs. For instance, they can travel over more challenging ground and are easier to navigate, removing the need for assistance from a nursing aid. The sportier aesthetic of mobility scooters is considered a psychological advantage for people who don't want to look like they are reliant on medical equipment.

Multi-Modal Access

Mobility scooters and their users require large turning radius, ramps and transition zones, and lifts to transition between light rail and bus transit. They are constantly evolving; they are gaining power, speed, range and stability. New design guidelines to facilitate the changing device should be considered, including charging stations and access to stations.

Average Speed*

3 mph

Maximum = 15 mph

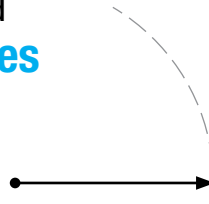
Dynamic Envelope

3 ft

(Minimum width)

Average Ten Minute Access Shed

.5 miles



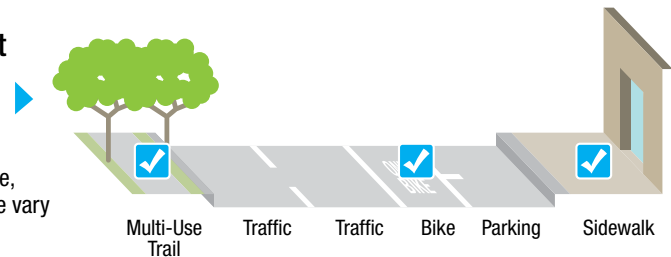
Energy Requirements

Battery powered:
45 miles/charge



Observed Street Use

Presents observed use, policies governing use vary by municipality.



Demographics

Primary: Seniors 65+ yrs.

Secondary: All ages with injuries or disabilities.

* www.activeforever.com



GREEN MODE-ELECTRIC-INNOVATIONS

Description & Trends

Devices such as the Puma, Uni-Cub, and Solowheel follow the trend of mobility devices with an environmental commitment; however, they offer more interesting and portable alternatives than many forms of electric transportation (such as NEVs).

As more devices such as these become popular amongst commuters, who are the main audience they are designed for, more frequent charging stations and new parking types will need to be designed to accommodate them.

Cost is a main concern for these devices, which are cheap to operate, but have initially high prices to purchase; the transportation network could benefit from the inclusion of personal transport devices such as these by utilizing a bike share or car model.

The Puma, in particular, is a modification to an existing device (Segway/Gyroscopic) that will aim to serve a population as the baby boomer generation begins to require assisted access devices; it is the beginning of a trend of customizing personal transportation for mobility without sacrificing speed and function.

Multi-Modal Access

New design guidelines to facilitate these evolving devices should be considered, including charging stations and access to stations.

* www.solowheel.com
www.inhabitat.com
www.segway.com

Average Speed*

8 mph

Maximum = 20 mph

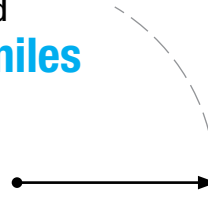
Dynamic Envelope

2-5ft

(Minimum width)

Average Ten Minute Access Shed

1.3 miles



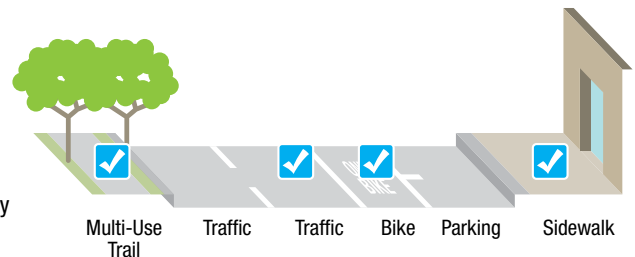
Energy Requirements**

Battery powered:
Varies



Observed Street Use

Presents observed use, policies governing use vary by municipality.



Demographics

Primary: Adults 18+ yrs.

(These are relatively new devices aimed at commuter populations)