Gateway Gold Line Bus Rapid Transit: A Closer Look at Health and Land Use

Technical Report
May 2016

Acknowledgements

Project Partners

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- African American Leadership Forum-Health & Wellness Work Group
- Gateway Corridor Commission
- Gateway Corridor Community Advisory Committee
- Gateway Corridor Policy Advisory Committee
- Gateway Corridor Technical Advisory Committee
- Living Healthy in Washington County
- Metropolitan Council
- Minnesota HIA Coalition and Multimodal Transportation Committee
- Oregon Public Health Institute
- Ramsey County Housing and Redevelopment Authority
- Saint Paul—Ramsey County Community Health Services Advisory Committee
- Washington County Housing and Redevelopment Authority

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Project Team

The Gateway Gold Line Bus Rapid Transit Health Impact Assessment was completed by a project team, comprising staff from Washington County Public Works, Washington County Public Health and Environment, and Saint Paul—Ramsey County Public Health.

Washington County

Public Works

RAMSEY COUNTY
Saint Paul – Ramsey County Public Health

Washington County

Public Health and Environment

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About This Document

This document is intended to serve as a resource to those seeking to protect and promote health through evidence-based land use decisions. The complex interaction between health and these conditions means healthcare alone cannot improve our health. In fact, health begins where we spend the most time—at home, at work, and in our communities. For this reason, how we design our communities matters. While this report focuses on Gateway Gold Line Bus Rapid Transit (Gold Line BRT) communities, the document can serve as a reference for planners and public health advocates working to promote health through comprehensive plans. The project summary is available as a separate document, *Gateway Gold Line Bus Rapid Transit: A Closer Look at Health and Land Use Project Summary,* at TheGatewayCorridor.com.

Project Summary

BACKGROUND

Our Environment Shapes Our Health

The places in which we live, work, and play affect our health. Man-made (or built) environments can support or limit healthy behaviors and the ability to get to basic needs and services. Our health begins with decisions on where to place resources such as grocery stores, schools, parks, and health care facilities within our cities and what methods of travel we are able to use. Communities should consider health as early as possible in these decisions to ensure all residents can lead healthy lives. Cities play an essential role in the design of our environments and as a result yield great power in creating healthy communities.

A Local Vision for Health

Cities regularly develop plans for their vision of the future and map how to reach that vision. These plans (called "comprehensive plans") help guide how cities will develop, where resources like jobs, housing, and trails will be located, and how we will travel throughout our communities. Individual and community health is certainly affected by these planning processes as cities aim to create livable communities. However, health is often missing from comprehensive plans and cities' mission and vision.

Certain comprehensive plan elements required by the Metropolitan Council—the metropolitan planning organization for the Twin Cities Metropolitan Area—provide opportunities to incorporate health. This study focuses on including health in land use decisions around the Gateway Gold Line Bus Rapid Transit (Gold Line BRT) project. The project team conducted outreach as part of this study and many community members provided feedback about the connection between health and where they live, work, and play. As a result, as cities work to update their comprehensive plans, they should consider health early and often, and engage community members to further define what health means to each community.

The Gold Line BRT is an Opportunity

The Gold Line BRT is a proposed transitway in the East Metro that will connect urban and suburban communities, jobs, retail, education, and recreation destinations. All-day transit service will be provided at the stations and will tie into the growing regional transit system. The route could open for service by 2023 and will provide new economic development opportunities as the region grows. This study (called a health impact assessment) is a part of broad planning efforts for the Gold Line BRT, and focuses on how health can be integrated into the comprehensive plans for the five cities along the corridor: Saint Paul, Maplewood, Landfall, Oakdale, and Woodbury. Because the eastern end of the route and station locations have yet to be determined, this report does not include specific details for some Oakdale and all Woodbury station locations. As part of each city's comprehensive plan, they will need to include the Gold Line BRT station areas and consider improvements around these stations that will work with the new transit line. These station areas present a unique opportunity for each city to implement their vision for a livable and healthy community.

Community Driven Process

The Gold Line BRT project has an extensive technical, policy, and community committee structure. These committees, along with other community groups, determined the factors considered most important to health when it comes to the built environment. Community representatives selected four elements important to health and influenced by land use decisions. These four elements are:

- Connectivity
- Housing
- Jobs
- Safety

Criteria for selecting the elements included:

- Availability of data,
- Interest from a wide range of stakeholders, and
- Ability to influence land use decisions.

Given these criteria, some items—such as air quality and childcare access—discussed by community representatives at outreach meetings were not included in the assessment.

What We Found Out

Community Health Profile

The project team collected information on health outcomes for the Gold Line BRT communities. As land use changes over time, we may see a change in health outcomes. The information collected serves as a baseline for the two counties and five cities along the corridor. For the purpose of this study, the best available data about health conditions are reported at a county level.

The overall health of people in the corridor is generally good by comparison to state and national benchmarks. Health conditions across the corridor demonstrate the impacts that income and education can have on our health. The western portion of the corridor, which is located in Saint Paul and Ramsey County, is characterized by lower median household income and lower high school graduation rates than the state average. Ramsey County also has higher portions of the population experiencing poverty (25% of children) and lacking health insurance compared to statewide numbers. By contrast, in the eastern portion of the corridor, median household income is 40% higher than the state average, but the average wage is well below what would be needed to afford most homes in the area. Outcomes such as high school graduation and low birth weight are also noticeably better than the statewide average.

Social and financial stress for households limits the ability to be healthy. The portion of households that are over-burdened by housing and transportation costs illustrates this struggle. For Ramsey County communities, the portion of income paid toward housing costs is relatively high; in more suburban communities, the combined cost of transportation and housing is significantly high. Additionally, racial and ethnic disparities exist when it comes to homeownership and other factors that influence the ability to be healthy. These disparities place populations of color at a notable disadvantage in achieving healthy outcomes as individuals and families.

How the Elements Influence Health

The following summaries for each health element—connectivity, housing, jobs, and safety—include a vision statement, what we heard from the community, highlights from the *Gold Line BRT Bus Rapid Transit HIA Technical Report* , and opportunities for action.

Connectivity

Vision Statement

Provide convenient and reliable ways to walk or bicycle to basic needs and services.

Why Connectivity Matters to Health

A 2005 article in the American Journal of Preventative Medicine[1] reported that 29% of people using transit to get to work met their daily requirements for physical activity by walking to work.

WHAT THE COMMUNITY IS SAYING

Community members want safe places to walk and bicycle between the station areas, businesses, and neighborhoods. Many respondents selected the presence of sidewalks as being crucial to a healthy community. Providing better pedestrian and bicycle connections will help people get to basic needs and services, while also providing opportunities to be physically active.

BETTER CONNECTIONS IMPROVE HEALTH

The ability to easily get to basic needs and services influence a person's social, economic, physical, and mental well-being. How we design connections (e.g., roads, sidewalks, paths, transit) to basic goods and

services determines how easily people can benefit from the availability of these resources. Safe walking and bicycling routes help more people get to public transportation and are crucial connections to healthy foods, schools, jobs, and health services. In addition, safe connections encourage people to be physically active. Improving connections help community members live healthy and productive lives.

Not all people want to or can travel by car. Over 1/5 of the seven-county area's zero vehicle households live in Gold Line BRT communities. Public transportation cannot connect all riders with door-to-door service, and taking transit typically involves walking or bicycling at the beginning and end of the trip. Development patterns in the Gold Line BRT communities vary from one city to another. For example, it is challenging to walk or bicycle near the proposed White Bear Avenue and Sun Ray Stations because the areas include large parking lots and buildings that are located far away from streets and sidewalks. This type of design encourages people to drive to these locations and creates a demand for parking. These areas also discourage walking and bicycling.

What Cities Can Do

Community representatives want cities to ensure that community members have the choice to walk or bicycle to basic needs and services including public transportation. Streets are important for better connections and a grid network provides the best opportunity for travel between destinations. As new businesses and homes are built along the Gold Line BRT, cities can consider opportunities to provide a street network that includes sidewalks and bicycle routes. Developers and property owners are important partners in designing these connections.

In the more developed sections of the Gold Line BRT, pedestrian and bicycle connections are missing and need to be completed. Bicycle lanes on streets leading to station areas can help people travel safely to these areas. If a station area is missing sidewalks, cities need to seek ways to include new sidewalks and trails to support walking and bicycling.

Cities need to consider the safety of pedestrians and bicyclists when completing a network of roads, sidewalks, and bicycle routes. Cities will have the opportunity to determine the safest routes to the station areas and the appropriate design measures (e.g., intersection crossings and lighting) that promote safe environments.

Building placement and design play an important role in creating areas where people can walk and bicycle. Cities can help decrease the demand for parking by developing a mix of land uses (e.g., housing, retail, and offices) near the station areas that support transit, while also building better pedestrian and bicycle networks. These actions provide convenient and reliable ways to walk or bicycle to basic needs and services and allow residents to live active and healthy lives.

Housing

Vision Statement

Increase housing options for all ages, incomes, and lifestyles.

Why Housing Matters to Health

Between now and 2040, the region will add 374,000 households. Roughly 40% of these households will earn less than 80% of area median income ($65,800 for a family of four).

WHAT THE COMMUNITY IS SAYING

Community members noted that affordable housing for all ages and income levels is important to have in the Gold Line BRT station areas. Individuals who selected “access to affordable housing” as an important issue in their community noted a strong relationship between housing and health. One respondent said simply “Access to affordable housing is a top social determinant of health.”

Social determinants of health include the physical and economic environments in which we live, work, and play. Housing, as an example, is the foundation for our daily lives. Where we live is where we sleep, store valuables, recover from illness, and raise of families. Our home and neighborhood conditions influence our ability to make healthy choices.

AFFORDABLE HOUSING IS IMPORTANT FOR PHYSICAL AND MENTAL HEALTH

People unable to afford housing costs are likely to struggle to pay for other basic needs. As a result, these individuals may drop medical insurance, skip meals, or go without proper health care. In addition, fewer affordable housing options may lead to unstable housing conditions including frequent moves, eviction, foreclosure, and even homelessness. Unstable housing can result in a poor quality of life and high levels of stress and depression. When housing is affordable, people have more resources to spend on other basic needs and services, which help support their overall health and well-being.

Transportation costs are the second-largest budget item for most families. When households spend more than 45% of their income on housing and transportation combined, they live in an area that is not affordable. There is a wide range of household spending on housing and transportation along the Gold Line BRT. For example, residents in Saint Paul, an area typically better served by transit, spend 39% of their household income on housing and transportation, while residents in Woodbury spend 53% of their income on housing and transportation. Living near a transit station can help reduce transportation costs for residents or at a minimum provide travel options for those who need them.

What Cities Can Do

Cities evaluate affordable housing needs as part of the comprehensive planning process. An important first step to ensure affordable housing is to plan for a range of housing options. Cities should consider modifying land use plans and other planning tools to ensure support for and to promote a range of

housing options at the Gold Line BRT stations. Cities can also explore innovative ways to attract developers to build housing options that fit the needs of their community based on a housing assessment.

Placing housing near grocery stores, jobs, health care, and other services provides opportunities to get to basic needs and services without having to drive or take transit long distances. These services help support overall health and well-being, and having a variety of businesses and land uses near transit stations can help minimize transportations costs and improve the affordability of the area. See the "Connectivity" section for more information on land use at Gold Line station areas.

Jobs

Vision Statement

Increase the number and variety of jobs available along the Gold Line BRT.

Why Jobs Matter to Health

Unemployment and low-paying jobs have been linked with stress and depression. According to research conducted for the Washington County Community Health Assessment, obesity rates among people living in poverty are double the rate of their higher-income peers. This suggests that the ability to get to jobs that provide a living wage is an important factor of health.

WHAT THE COMMUNITY IS SAYING

Community representatives said that having jobs available near the Gold Line BRT stations would encourage people to use transit services. They also stated that it is important to have jobs for a variety of people and skills located near stations because it allows people who do not own a vehicle to get to work.

STABLE, WELL-PAYING JOBS SUPPORT HEALTH

Financial challenges for individuals without a job have serious impacts on individual and family health. A job can mean the difference between struggling to pay for basic needs (e.g., healthy food and health services) and having the choice to lead a healthy, thriving life. People with stable, well-paying jobs tend to live longer and have better physical and mental health.

While cities typically cannot offer a job for every individual living in their community, transit helps connect individuals with employment opportunities. In addition, the ability to get to a job via transit increases the number of potential applicants for positions connected by the regional transit system. In other words, companies can hire from a larger labor pool.

A living wage is the amount needed for a worker to afford the cost of living in their community. This amount varies by location. Living wage jobs increase a person's ability to participate in the economy and to share in its benefits, according to Minnesota Compass. Transit connections improve a person's ability to get to stable, well-paying jobs.

What Cities Can Do

Jobs are spread throughout the region, making it difficult, expensive, and time consuming for workers without a car to reach potential places of employment. Increasing transit connections to jobs is important, as it provides workers with an affordable and reliable way to get to work. It also allows employers to attract and retain employees, regardless of whether the employees have a car. Currently, there are limited transit options along the Gold Line BRT.

Cities could seek opportunities to support new jobs and businesses at the Gold Line BRT station areas. For example, cities can evaluate their economic development plans, land use plans, and planning tools to ensure they support and promote job creation at the Gold Line BRT station areas. Cities can also explore innovative ways to attract new businesses to the station area. Cities should connect jobs to station areas with safe sidewalks and bicycle routes. These elements allow transit riders to travel safely from the station to their place of employment. Please see the "Safety" and "Connectivity" sections for more information on safely connecting communities.

Safety

Vision Statement

Create safe places for walking and bicycling, while reducing crime.

Why Safety Matters to Health

The likelihood of fatalities in crashes involving a vehicle and a pedestrian or person on a bicycle decreases substantially as vehicle speed decreases[2].

WHAT THE COMMUNITY IS SAYING

In addition to personal safety, community representatives commented on the importance of being able to travel to and from stations and other local destinations without fear of getting hit by a car. For example, these stakeholders highlighted the need for complete and well-maintained sidewalks and well-lit streets. They also overwhelmingly selected the presence of sidewalks as being fundamental to a healthy community.

SAFE SPACES CONTRIBUTE TO HEALTHY COMMUNITIES

Crash rates and accident levels have shown that the design of our built environment has not done enough to protect pedestrians and bicyclists. Historically we built our streets (including sidewalks) and intersections to help cars travel quickly between destinations with little focus on walkers and bicyclists. As a result, walking and bicycling have become less safe over time. Often the most frequent users of sidewalks and bicycle routes are individuals with no other transportation options.

Providing a built environment with pedestrian- and bicycle-friendly design is important to safety. The same elements (e.g., street lighting and landscaping) that create welcoming spaces help promote safety both from accidents and from crime. Research has also shown that having more people present in an

area helps to deter crime. In addition, these spaces, when designed for both people and cars, can help create a sense of belonging and promote healthy behaviors like physical activity. When designed well, spaces can help meet diverse needs of the population.

In Gold Line BRT communities, personal safety and crime prevention were among the elements perceived as having the greatest influence on creating healthier environments. Community members commented that if they do not feel safe, they are far less likely to use transit. Community members also listed the importance of having good lighting and a variety of services available at the station areas to create more activity on the street.

What Cities Can Do

Cities can create safer places for pedestrians by implementing good design. Good design takes into consideration the built environment including buildings, roads, and sidewalks and how it influences safety. For example, people feel safer when there are many people walking on the street and business entrances are visible from the street. A good design policy that incorporates safety is called "Crime Prevention Through Environmental Design (CPTED)," which focuses on building design, landscaping, and street design to invite more people to public areas and reduce spaces where crime could occur.

Another example of good design is the use of lighting along sidewalks. Sidewalk and street lighting creates a more inviting space and encourages people to be out after dark. Lighting also enables people to observe what is going on around them. The ability to observe surroundings is referred to as natural surveillance. Natural surveillance allows people to easily see their surroundings without any obstructions (e.g., tall fences and hidden alleys) and increases perception of safety in an area. The types and placement of fencing, doors, and windows increases natural surveillance. Cities can work with stakeholders and developers to use good design to achieve safer places.

A safe pedestrian place also includes a connected sidewalk network and safe crossings. Sidewalks on both sides of the street allow pedestrians to get to destinations without walking in traffic. Pedestrian and bicycle connections are more thoroughly discussed in the "Connectivity" section.

Suggested Recommendations

Similar to the way the elements were selected, suggested recommendations were included if positive health outcomes could result from land-use decisions. Suggested recommendations were determined through a review of available research and an analysis of current practices in each city. Since health results from complex interactions between people and their communities, cities have the opportunity to implement solutions they feel best serve their residents. The suggested recommendations listed below can be implemented in any combination to help build healthy, livable communities.

Equity

Because equity regularly came up in conversations with community representatives, is included as part of community health assessments conducted in both Ramsey and Washington Counties, and is one of

five outcomes included in ThriveMSP 2040—the regional vision for the Twin Cities Metropolitan Area—it is important cities to consider this topic as part of the comprehensive planning process.

- Link equity to all health elements. Each city should go through their own process to define what equity means to them while considering the Metropolitan Council's definition.

Suggested Actions for City Governments

- Determine what health means to your city and provide health specific questions as you collect input from community representatives for the comprehensive plan.
- Invite diverse individuals to participate in decision-making discussions, including the comprehensive plan.
- Ensure that residents have the choice to walk or bicycle to basic needs and services, not just for recreation. A pedestrian and bicycle assessment could be done to determine gaps and areas of opportunity in the existing network.
- Provide a range of housing options for all incomes, ages, and lifestyles based on the assessment of needs for your own community.
- Plan a mix of land uses at station areas that meet market demand, input from stakeholders, and densities that support transit.
- Assess your plan review policies to ensure that development supports safe communities.

Suggested Actions for Other Stakeholders

- Use the results of this study to talk with city staff and elected officials about the importance of health in your community and in comprehensive plans.
- Participate in local planning and zoning commissions. These committees have an ongoing role in planning. Look for opportunities to attend meetings, provide feedback, and join the committees.
- Educate others on the connections between the built environment, land use, and health.
- Build partnerships between public health advocates and city planners to advance health in city planning processes.

Conclusion

Visions for Health

Each city has an opportunity to create a vision for health as part of the comprehensive planning process. The Gold Line BRT cities—Saint Paul, Maplewood, Landfall, Oakdale, and Woodbury—should strive to understand the power of the built environment in creating healthy spaces and their role in creating more livable communities. The Gold Line BRT station areas can become models for healthy design in each community as cities work to support health through land-use changes.

Technical Report

Introduction

Gateway Gold Line Bus Rapid Transit

Gateway Gold Line Bus Rapid Transit (Gold Line BRT) is a proposed transitway in the Twin Cities Metropolitan Area that will connect urban and suburban communities, corporate campuses, educational and commercial centers, and recreational destinations. The line will run next to Interstate 94 (I-94) in an exclusive lane. The exclusive bus lanes would be part of a separate bus-only system, not added to I-94 and will not take away a lane from the interstate. The Gold Line BRT would be Minnesota's first bus rapid transit (BRT) line in an exclusive lane.

Bus rapid transit (BRT) is a high-quality bus system that delivers fast, comfortable and cost-effective services. Because BRT contains features similar to a light rail system, it is much more reliable, convenient and faster than regular bus services. The system would include the following features:

1. **Bus-only lanes** make for faster travel and ensure that traffic congestion will not delay the buses.
2. **Fare payment at the station**, instead of on the bus, eliminates the delay caused by passengers waiting to pay on board.
3. BRT vehicles receive **signal priority** at intersections.
4. A **station platform level with the bus** allows for quick and easy boarding. This also makes it fully accessible for wheelchairs, disabled passengers, strollers, and carts with minimal delays.

The proposed route for the Gold Line BRT (Figure 1) will serve several different communities with diverse characteristics and needs. A wide range of stakeholders—large and small businesses, neighborhood and community organizations, human service providers, educational institutions, residents, and city governments—have an interest in the proposed station locations and the changes around these station locations. The station areas will influence how people are able to move through their communities and how they connect with essential resources like jobs, education opportunities, and social activities. These connections to basic needs and services shape the decisions we are able to make, including the choices we have to lead healthy lives.

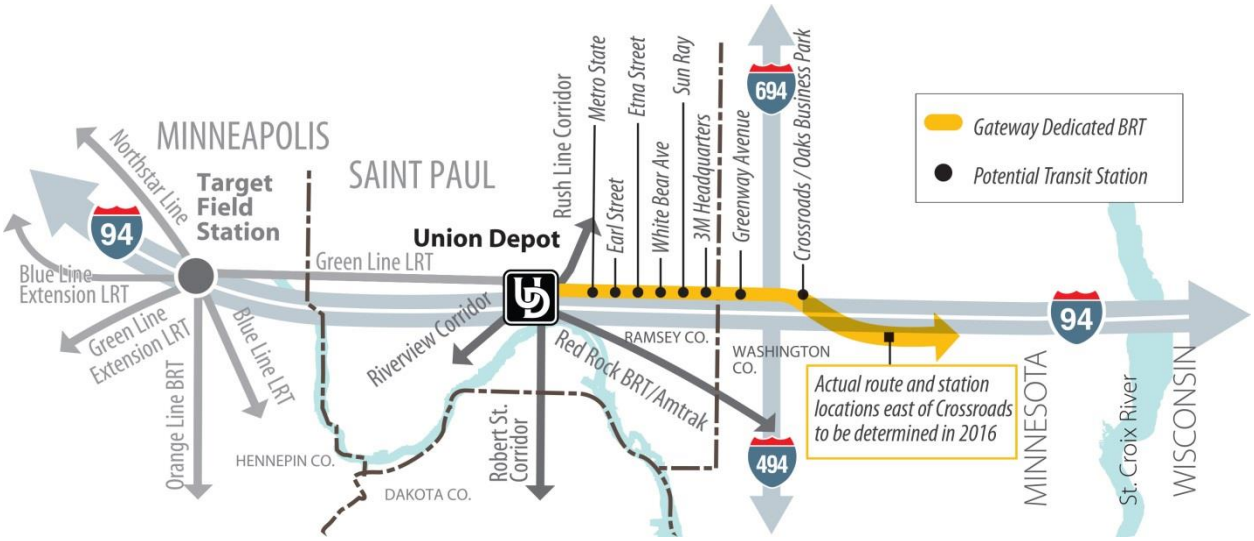

Figure 1: Gateway Gold Line Bus Rapid Transit Map

Transportation, Land Use, and Health

Our health is shaped by the conditions in which we live, work, and play. The complex interaction between health and these conditions means healthcare alone cannot improve our health. In fact, health begins where we spend the most time—at home, at work, and in our communities. For this reason, how we design our community matters. Planners hold great power in building communities where all people have the opportunity to lead healthy lives.

Transportation plays a central role in how we interact in our communities, and these interactions shape our health. Historically, planning decisions have not considered the link between health and transportation. Many of the choices we can make for our health are determined by where we live relative to jobs, schools, grocery stores, parks, and other amenities, as well as our ability to get to those resources. Accordingly, transportation is the critical link to how we can get to basic goods and services, and is a key component to health.

Land use planning means making choices on how land, water, and resources are used, and is a crucial first step in the decisions that design our communities. These decisions determine how people access jobs, education, recreation, commercial, and cultural opportunities in their communities. Cities' land use decisions start with their vision for their community as captured in the comprehensive plans.

Comprehensive Planning

Cities regularly develop comprehensive (or comp) plans to illustrate their vision of the future, map how to reach that vision, and include details on appropriate uses for land in a community. These plans help guide how cities will develop, where resources like jobs, housing, and trails will be located, and how we will travel throughout our communities.

A comprehensive plan is a framework and policy document for changes affecting many aspects in a community, especially changes affecting health. However, health is often missing from comprehensive plans and a city's mission and vision. Considering health early on and often through the comprehensive planning process ensures health becomes central to a city's vision for the future.

The Metropolitan Council—the metropolitan planning organization for the Twin Cities Metropolitan Area—requires the comprehensive plan to address transportation, including details on changes expected from transitway projects like Gold Line BRT. This requirement provides an opportunity to incorporate transit-related health considerations in the plans.

Consequently, comprehensive plans are important policy documents that drive change in a community for years to come, and are valuable tools to support health in a community. The Gold Line BRT is expected to open by 2023, although development and re-development around stations may begin before the route is operational and could occur for many years afterwards. It is important to consider health early and often in these decisions.

Equity

Equity is an important goal of comprehensive planning processes. The plans serve as a record for community consensus on the future actions cities will take, including decisions on the distribution of positive and negative impacts of policies and actions. Variations in these impacts limit people's choices and can lead to avoidable and unfair differences in health. The choices individuals have determine the choices they are able to make. When all people have the opportunity to be healthy, communities are more equitable.

The Metropolitan Council has included equity as an outcome in its vision for the region for the next 20 years. The vision, called Thrive MSP 2040, describes equity as connecting "all residents to opportunity.[3]" Thrive MSP 2040 does not specifically focus on health equity. This broader view of equity focuses on making changes that allow everyone to participate fully in all aspects of society.

While Gold Line BRT HIA participants frequently noted equity as an important issue, they did not select it as one of the final four elements to be studied. Because equity regularly came up in conversations with community representatives, is included as part of community health assessments conducted in both Ramsey and Washington Counties, and is one of five outcomes included in ThriveMSP 2040—the regional vision for the Twin Cities Metropolitan Area—it is important cities consider this topic as part of the comprehensive planning process.

There is no one-size-fits-all approach to equity. Cities can work collaboratively with community members to develop and achieve the plan's vision for an equitable, healthy community. Details included in this report may serve as a resource for conversations on both health and equity.

Why a Health Impact Assessment

The complex interaction between health and these conditions means healthcare alone cannot improve our health. In fact, health begins where we spend the most time—at home, at work, and in our communities. This HIA process provided a framework for reviewing health benefits and impacts of possible land-use changes around Gold Line BRT stations. This study resulted in suggested recommendations on how to incorporate health into comprehensive plans. Since many of the land-use decisions that impact health will be discussed as part of the comprehensive planning process, an HIA allowed project staff to review health benefits and impacts and propose a set of recommendations to Gold Line BRT communities. These recommendations, if adopted, will move health to the center of a community's vision for the future.

The six-step framework provides a systematic process to analyze a proposed policy (e.g., comprehensive plans) for potential benefits and impacts prior to implementation. The six steps are:

- Screening: Identify plans, projects or policies for which an HIA would be useful
- Scoping: Determine which health effects to consider
- Assessment: Analyze risks and benefits and identifying which people may be affected and how
- Recommendations: Suggest changes to promote positive health outcomes or to minimize adverse health effects
- Reporting: Present the results to decision makers and stakeholders
- Monitoring: Track the effect of the HIA on the decision

The HIA process typically includes a broad definition of health, involvement from both decision makers and stakeholders, and explicit consideration of equity. Input for stakeholders, particularly vulnerable populations, should be incorporated in each of the six steps. More information about the HIA is available at http://www.humanimpact.org/new-to-hia/.

This report focuses on three of the steps: Scoping, Assessment, and Recommendations.

What We Studied

HIA Step: Scoping

Stakeholder input guided the development of the project scope. Project participants attended a stakeholder engagement workshop and completed a worksheet to assist project staff in prioritizing the study topics (called elements). See the Acknowledgements section on page ii for more information about project contributors.

The project team finalized the list of elements to be studied in this HIA based on:

- Availability of data
- Interest from a wide range of stakeholders, and
- Ability to influence land use decisions.

Given these criteria, some items—such as air quality and childcare access--discussed by community representative at outreach meetings were not included in the assessment.

Elements to be Studied

Community representatives identified a wide range of health concerns in their communities. Staff sorted the feedback into four broad categories to study in further detail. Because the four elements represent such broad topics, a vision statement was drafted for each element to help focus the assessment on the specific concerns identified by stakeholders. Community groups reviewed the following four elements and supporting vision statements to ensure staff incorporated public input into the project scope. The vision statements are intended to reflect the corridor as a whole, and not individual station areas.

- **Connectivity**: Provide convenient and reliable ways to walk or bicycle to basic needs and services
- **Housing**: Increase housing options for all ages, incomes, and lifestyles
- **Jobs**: Increase the number and variety of jobs available along the Gold Line BRT
- **Safety**: Create safe places from walking and bicycling, while reducing crime

What We Learned

HIA Step: Assessment

The purpose of the assessment was to evaluate the extent to which the existing connectivity, housing, jobs, and safety conditions in the corridor meet the vision statement for each element.

- Connectivity: Do each of the Gold Line BRT communities provide convenient and reliable ways to walk or bicycle to basic needs and services?
- Housing: Do each of the Gold Line BRT communities provide housing options for all ages, incomes, and lifestyles?
- Jobs: Does the Gold Line BRT provide a high number and wide variety of jobs near station locations?
- Safety: Are the Gold Line BRT communities safe places for walking and bicycling? Do they feel safe from crime?

The performance of each city and the corridor as a whole was evaluated using existing data, comprehensive plans, and zoning codes.

Study methodology is available in Appendix A.

Health in the Corridor

The project team collected information on health outcomes for the Gold Line BRT communities. As land use changes over time, we may see a change in health outcomes. The information collected serves as a baseline for the two counties and five cities along the corridor. For the purpose of this study, the best available data about health conditions are reported at a county level. See Table 1 for more information on health conditions in Ramsey and Washington Counties.

The overall health of people in the corridor is generally good in comparison to state and national benchmarks. Health conditions across the corridor demonstrate the impacts to health that income and education can have on our communities. The western portion of the corridor, which is located in Saint Paul and Ramsey County, is characterized by lower median household income and lower high school graduation rates than the state average. Ramsey County also has higher portions of the population experiencing poverty (25% of children) and lacking health insurance compared to statewide numbers. By contrast, in the eastern portion of the corridor, median household income is 40% higher than the state average, but the average wage is well below that needed to afford most homes in the area. Outcomes such as high school graduation and low birth weight are also noticeably better than the statewide average.

Social and financial stress for households limits the ability to be healthy. The portion of house- holds that are over-burdened by housing and transportation costs illustrates this struggle. For Ramsey County communities, the portion of income paid toward housing costs is relatively high; in more suburban communities, the combined cost of transportation and housing is significantly high. Additionally, racial and ethnic disparities exist when it comes to homeownership and other factors that influence the ability to be healthy. These disparities place populations of color at a notable disadvantage in achieving healthy outcomes as individuals and families.

Table 1: Overview Health Data for Gold Line BRT Counties and Minnesota

OVERVIEW DATA	Ramsey	Washington	Minnesota	Years(s)
Population Characteristics				
Median household income	$51,719	$77,069	$56,944	2011
Children in poverty	25.60%	7.10%	15.30%	2011
Morbidity and Mortality				
Reproductive & birth outcomes				
Infant mortality (per 1000 live births)	5.6	4	4.8	2009-2013
% Low birth weight (≤ 5.5 lbs)	2.4	1.6	1.8	2009-2013
% Premature births (< 37 wks gestation)	7.8	6.9	7.4	2009-2013
Hospitalizations (per 100,000)				
Asthma emergency department visit	61.3	25.2	40.1	2011-2013
Asthma hospitalization	8.2	3.6	6.1	2011-2013

COPD hospitalizations	26.7	19.4	29.3	2011-2013
Heart attack hospitalizations	26.2	26.2	26.7	2011-2013
OVERVIEW DATA	**Ramsey**	**Washington**	**Minnesota**	**Year(s)**
Cancer incidence (per 100,000)				
All cancer types combined	469.9	495.9	466.2	2008-2012
Breast	129.5	144.7	130.3	2008-2012
Lung and bronchus	57.6	56	55.4	2008-2012
Colorectal	36.7	40.1	41	2008-2012
Melanoma	23.9	31.2	27.1	2008-2012
Non-Hodgkin lymphoma	24.2	23.7	23	2008-2012
Bladder	22.8	24.2	22.8	2008-2012
Leukemia	16.3	17.1	16	2008-2012
Kidney	13.6	15.8	15.6	2008-2012
Access to Health Services				
Uninsured				
% People ≤ age 65 without insurance	11.2	6.4	9.2	2012
Childhood immunizations				
Children who receive full series	51.2	53.8	62.9	2013
Primary Care Physicians				
Population to Primary Care Physicians ratio	953:1	884:1	1113:1	2012
Dentists				
Population to Dental Care Provider ratio	1272:1	1451:1	1529:1	2013
Mental Health Providers				
Population to Mental Health Provider ratio	298:1	544:1	529:1	2014
CONNECTIVITY	**Ramsey**	**Washington**	**Minnesota**	**Years(s)**
Healthy Eating				
Food environment index score (0 to 10)	7.7	9.0	8.3	2012
% Eating ≥ 5 servings/day fruits & vegetables	34.3	34.4	**	2014
Physical Activity				
% Adults meeting physical activity guidelines	52.4	57.4	52.7	2013-2014
Disease Burden				
% Adult obesity (BMI ≥ 30)	26.7	23.5	25.5	2013-2014
% Adults ever diagnosed with Diabetes	7.7	6.6	7.4	2013-2014
High Blood Pressure Prevalence	22.3	22.9	27.0	2013-2014
HOUSING	**Ramsey**	**Washington**	**Minnesota**	**Years(s)**
Mental Health				
% Householders ≤ 65 years old living alone	10.3	7.8	10.1	2010-2014
SAFETY	**Ramsey**	**Washington**	**Minnesota**	**Years(s)**
Injury and Death due to Falls, Age 65+ (per 100,000)				
Fall injury emergency department visits	2763.4	3617.0	2850.5	2008-2012

Fall injury hospitalizations	1842	1875	1502	2008-2012
Fall deaths	9.0	9.8	11.8	2008-2012

Many of the conditions in Table 1 are considered social determinants of health, the physical and economic environments in which we live, work, and play. These determinants have direct impacts on individual health and the health of a community. Differences between the counties and the region may highlight particular opportunities to improve health. More information on community health is available in the Ramsey County[4] and Washington County[5] community health assessments.

Need for Transit

Approximately 64,600 people live within a one-mile radius of the Gold Line BRT with a projected growth of nearly 30% by 2040[6]. Approximately 32,000 people without a vehicle live near the proposed transitway representing over 20% of the "zero-vehicle" population in the Twin Cities, and this percentage is greater than the regional average due in part to significantly higher than average numbers in Saint Paul, Maplewood, and Oakdale. The current transit system has a limited number of options available to connect people in the east metro with employment, retail, education, and social activities.

Poverty in Gold Line BRT Communities

Gold Line BRT communities experience differences along racial and ethnic lines that limit opportunities for people of color to lead healthy lives. To illustrate, several Gold Line BRT stations are located in Saint Paul's East Side, where 55% of residents live in poverty, dramatically higher than the metro area poverty rate of 10.3%. Additionally, the East Side saw a decrease of more than half its white population between 1990 and 2010. By 2010, 26% of the area's residents were foreign-born, with Asians becoming the largest community of color. The Asian community in Saint Paul's East Side accounts for 28% of the Asian population in the metro area.

Racial and ethnic disparities in the metro region are a challenge to future economic vitality, and transit projects like Gold Line BRT can help connect residents to the opportunities necessary to lead healthy, prosperous, and equitable lives. Cities should understand the differences experienced by people of color and other vulnerable populations in their communities. Since equity is an important goal in comprehensive planning processes, cities can work collaboratively with community members to develop and achieve the plan's vision for an equitable, healthy community.

Results by Element

Connectivity

Vision Statement

Provide convenient and reliable ways to walk or bicycle to basic needs and services.

Relationship to Health

Connectivity refers to the ability to get to basic needs, services, activities, and destinations. Examples of these basic needs and services include schools, grocery stores, and health care providers. Being able to reach these types of destinations is essential for healthy communities. A Federal Highway Administration (FHWA) study completed in 2013[7] reported fewer transportation options could lead to increased transportation costs and inequitable access to employment, housing, and healthy foods.

In relation to transportation, this element also covers physical connectivity of all types of transportation including travel by car, transit, bicycle, and foot. Adequate pedestrian, bicycle, and transit infrastructure is necessary to create safe connections for all users, including people who do not own a vehicle. These transportation types also allow people to increase their physical activity. For example, American Journal of Preventative Medicine (2005) found 29% of people using transit to get to work met their daily requirements for physical activity from walking to work[8].

Community Input

Walking and Bicycling to Destinations

Design decisions influence how people perceive distances to destinations, their willingness and ability to get to a location, and their safety when traveling. When asked about health in their communities, Gold Line BRT community members noted the need for complete and well-maintained sidewalks, good lighting, and easy access between housing, retail, services, and jobs. Respondents overwhelmingly selected sidewalks as an essential factor in healthy communities. Community members also commented that bicycle trails (both on and off the street) could help increase the safety and convenience of bicycling.

Parking

During the HIA process, community members commented on the need for parking for people who do not live within walking distance of the stations. Parking is challenging for many communities seeking to change from suburban-style developments of the 1970s-2000s to transit-oriented development in station areas. Parking is convenient for drivers, and most businesses outside of downtown Minneapolis and downtown Saint Paul report that parking is essential to their continued prosperity. However, parking requires a lot of space, is visually unappealing, is often underused, creates longer distances between buildings, and impairs the ability to walk between destinations.

Parking is being planned for certain stations (e.g., Sun Ray station area) and is currently available at others (e.g., Union Depot). For stations without parking, and even for those stations with, many riders will walk or bicycle to the stations. Everyone arriving to the Gold Line BRT stations will ultimately use pedestrian amenities, namely sidewalks, during their trip. For example, people arriving by car will use sidewalks to get to the stations and other destinations. As a result, the placement of parking near the stations will influence how all transit users will be able to get to the station.

Existing Conditions

Walking and Bicycling to Destinations

This section includes maps (Figures 2 through 7) of resources like churches, grocery stores, schools, libraries, etc. located within one-half mile of proposed Gold Line BRT stations. The maps are located at the end of this section for easier readability.

In Saint Paul, the sidewalk network is mostly developed at the Union Depot, Mounds Boulevard, and Earl Street station areas. The area near Union Depot (Figure 2) is densely developed and well connected. As such, people can access many destinations by walking or bicycling. The other station locations in Saint Paul (Figure 3) share many characteristics. The locations have incomplete sidewalk networks and lack basic goods and services such as grocery stores or public services near the station areas. For the White Bear Avenue and Sun Ray Stations (Figure 4), destinations are difficult to get to because of the size of the parking lots, location of the buildings on the property (i.e., building setbacks), and the uses allowed in the buildings (i.e., auto-oriented uses such as big-box retail and gas stations). The City of Saint Paul is planning to expand its bicycle network, which will help improve travel options over time.

In Maplewood, the 3M station area (Figure 5) includes buildings that are further apart and have large parking lots. Landfall (Figure 6) has some sidewalks within the community. However, Landfall does not connect with nearby neighborhoods in Oakdale because its streets and sidewalks are internal to the city. Oakdale station areas (Figure 6), like Maplewood, have environments that would be difficult for pedestrians and bicyclists to navigate when trying to get to the Gold Line BRT. Sidewalks are incomplete and not well connected, though certain streets have off-street walking and bicycling paths.

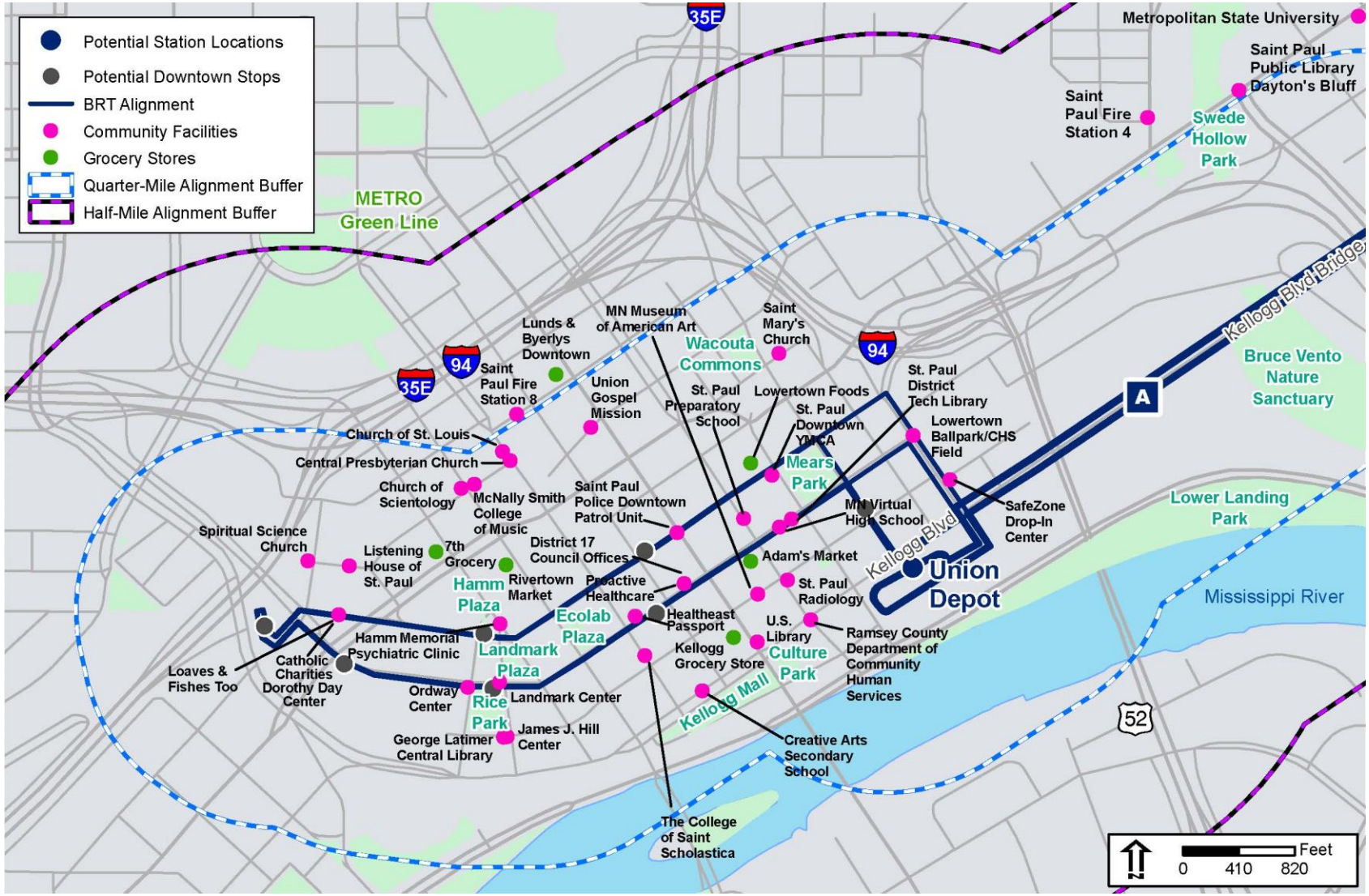

Figure 2: Gold Line BRT - Saint Paul Union Depot Station Area

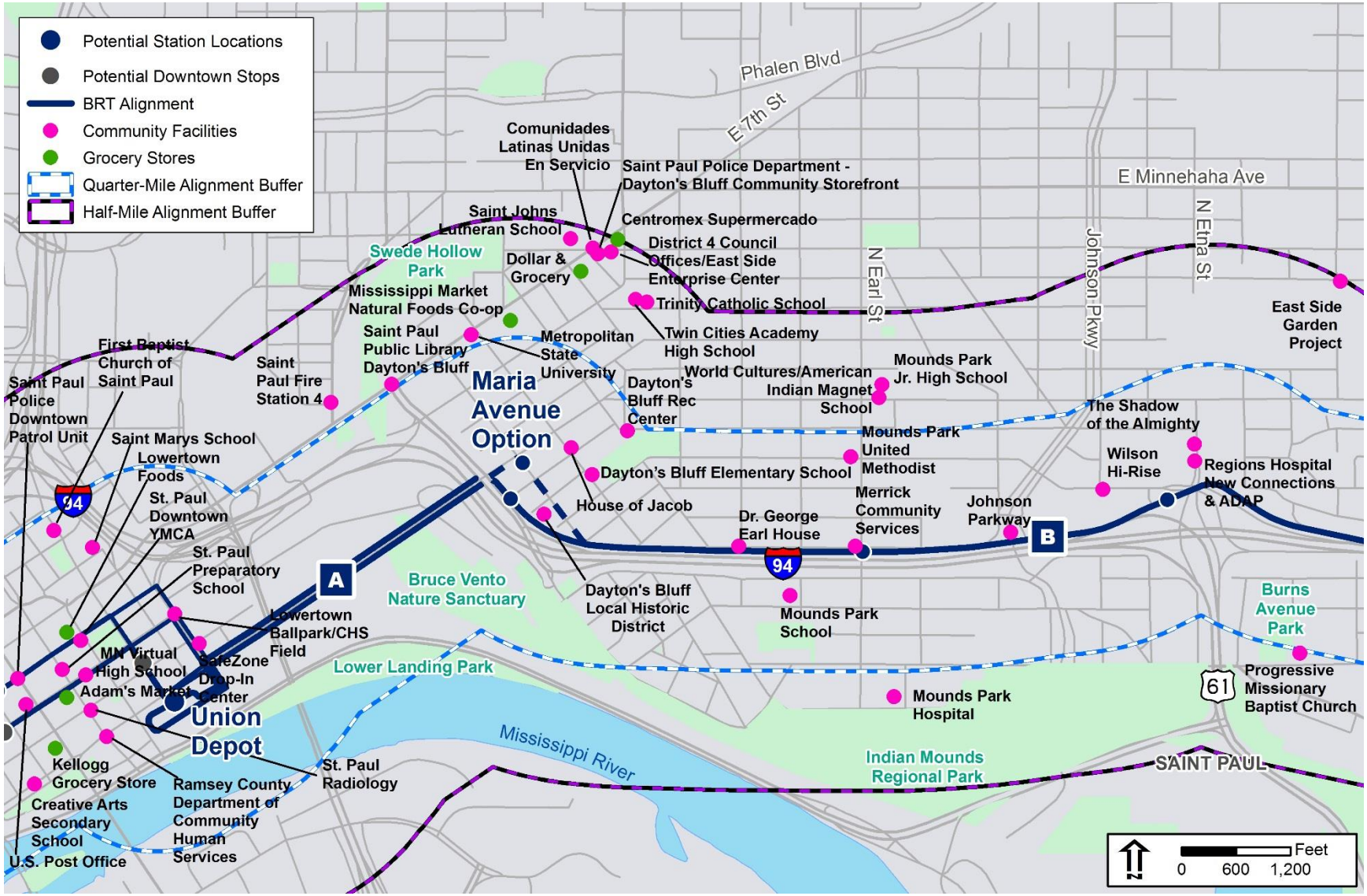

Figure 3: Gold Line BRT - Saint Paul Dayton's Bluff Station Area

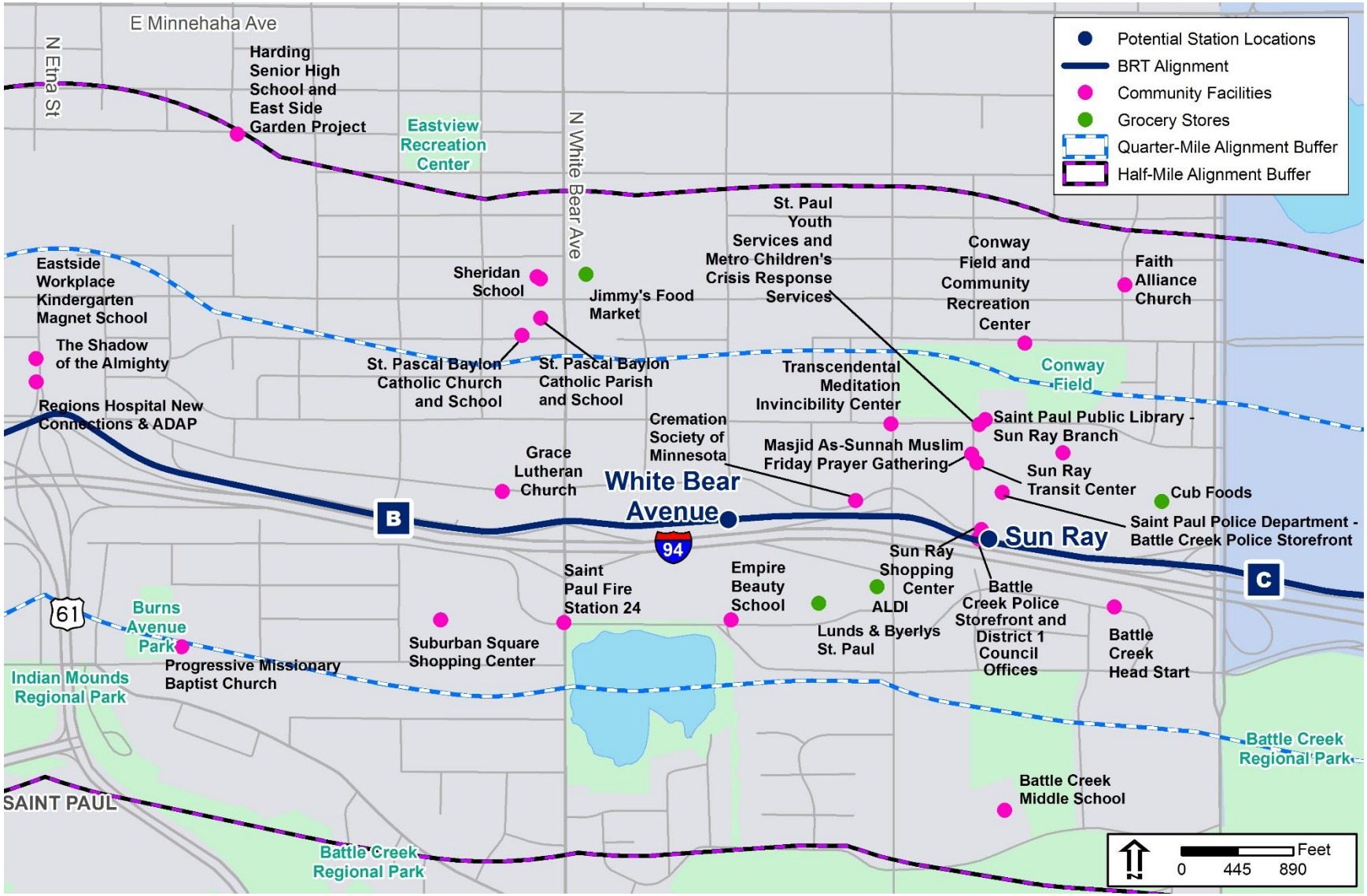

Figure 4: Gold Line BRT - Saint Paul White Bear Avenue and Sun Ray Station Areas

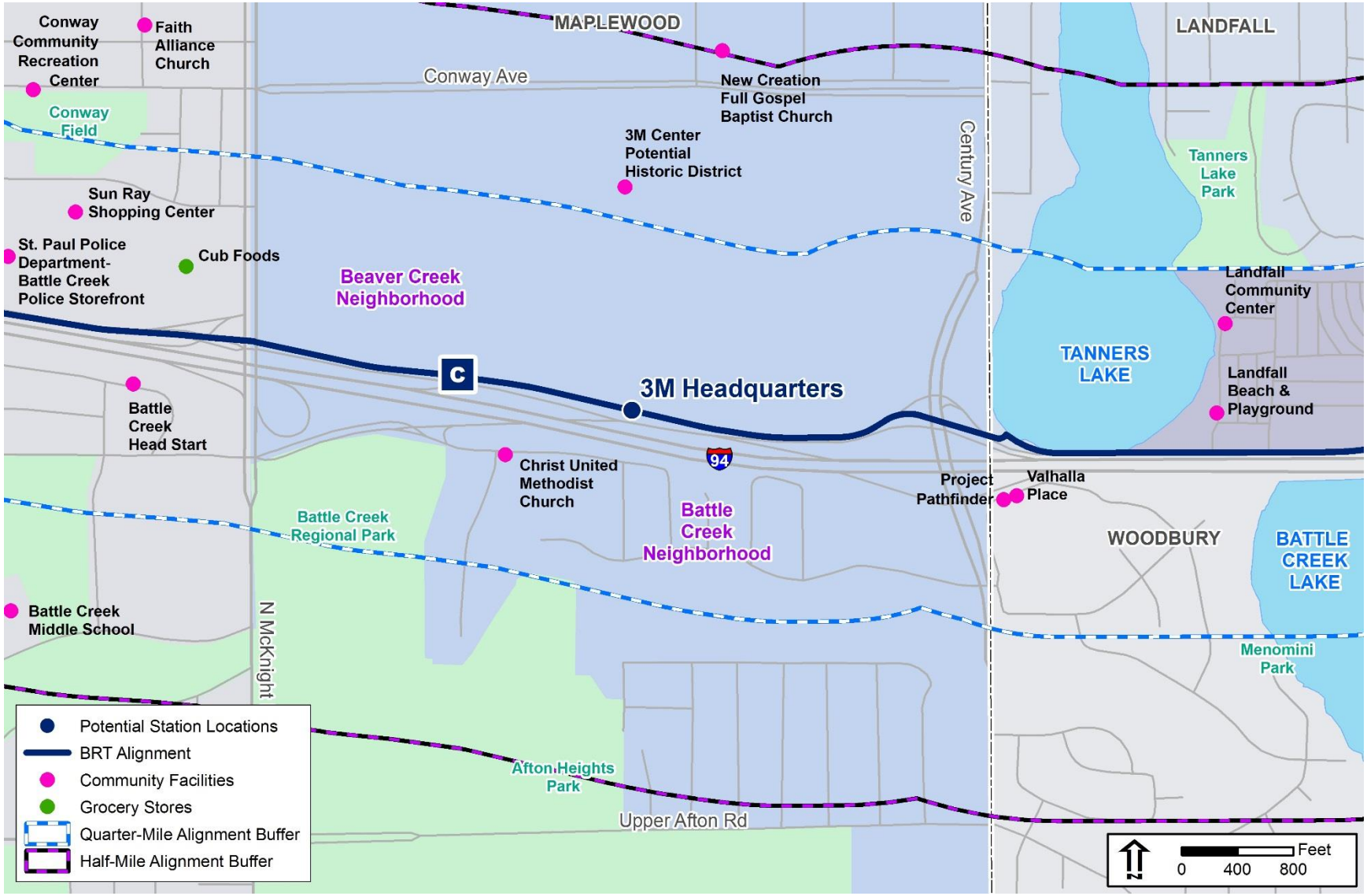

Figure 5: Gold Line BRT - Maplewood (3M) Station Area

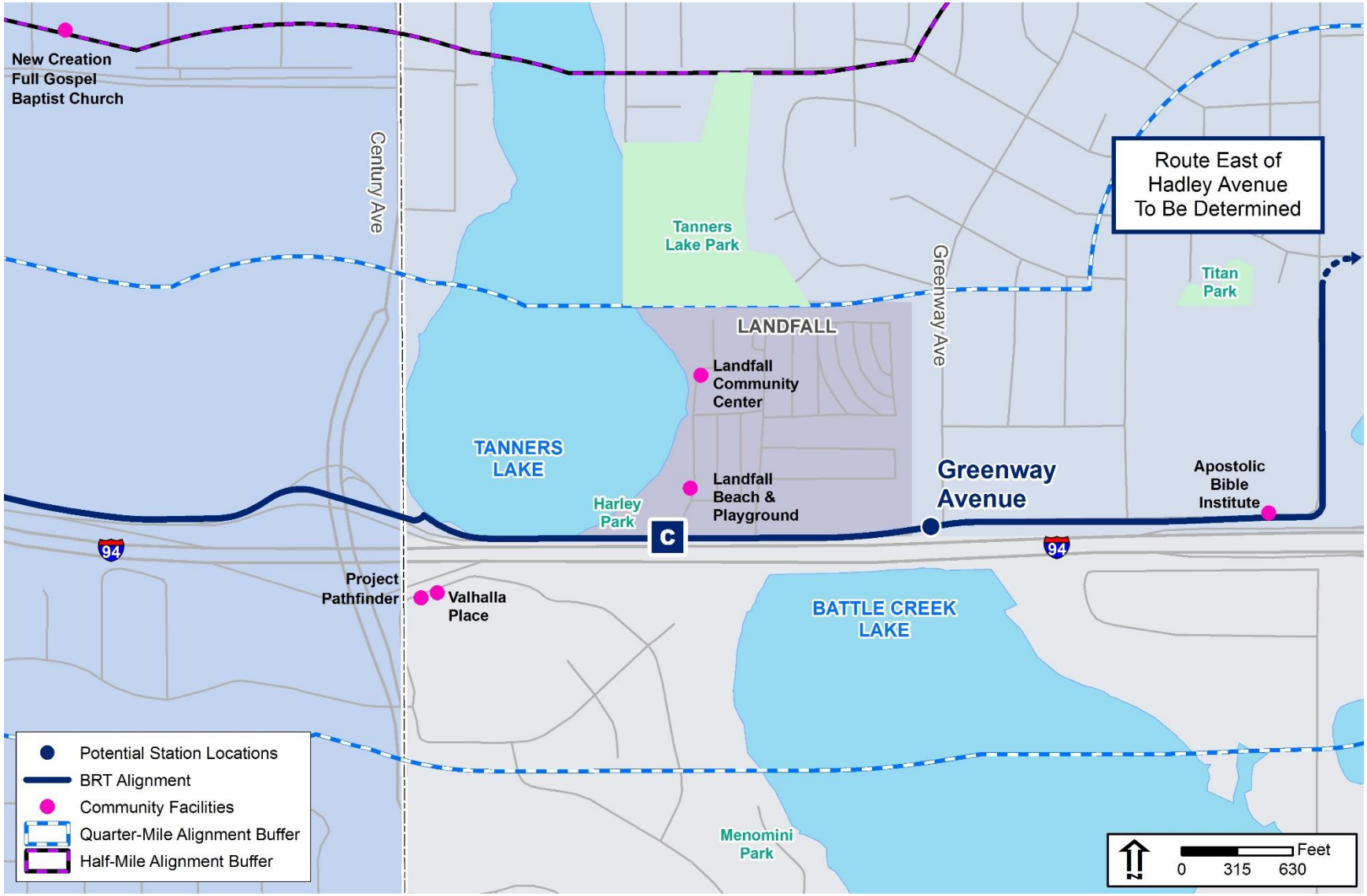

Figure 6: Gold Line BRT - Landfall/Oakdale Station Area

Parking

Free parking is provided throughout the corridor, and parking lots and street parking are common. Union Depot is unique as it is the only station area with parking meters and structured parking requiring people to pay. An inventory of the parking supply in the corridor is not available for this HIA. However, a high-level summary of parking characteristics is listed below.

- Street parking is available near most of the Saint Paul stations.
- Businesses near the Etna Street, White Bear Avenue, and Sun Ray Stations are surrounded by parking lots.
- Parking is generally located near retail, commercial, office, and multi-family housing in Maplewood, Landfall, and Oakdale.
- Oakdale and Maplewood have similar development patterns designed for travel by car. These patterns include locating large parking lots next to buildings that are set back from sidewalks.

Connectivity Results

Walking and Bicycling to Destinations

Walk Score and Bike Score are tools that evaluate the ability to walk and bicycle in a community. A higher score indicates more destinations are available within a reasonable distance and infrastructure is available to help people travel between locations. More details on Walk Score and Bike Score are available in Appendix A. Walk Scores and Bike Scores are presented in Table 2 for each Gold Line BRT station and the city in which the station is located. Because a Bike Score is calculated using bicycle infrastructure data provided by individual local governments, it is not available for all cities.

Table 3 explains the meaning of each score type.

Table 2: Walk Score and Bike Score for Gold Line BRT Stations and Communities

Station	Walk Score	Bike Score	City	Walk Score	Bike Score
Union Depot	82	72	**Saint Paul**	56	62
Mounds Boulevard	59	67	**Saint Paul**	56	62
Earl Street	59	61	**Saint Paul**	56	62
Etna Street	41	63	**Saint Paul**	56	62
White Bear Avenue	57	52	**Saint Paul**	56	62
Sun Ray	59	75	**Saint Paul**	56	62
3M	29	N/A	**Maplewood**	21	N/A
Greenway Avenue	18	N/A N/A	**Landfall** **Oakdale**	N/A 17	N/A N/A
To be determined	N/A	N/A	**Woodbury**	16	N/A

Table 3: Walk Score and Bike Score Ranges and Meanings

Score	Meaning of Walk Score
90-100	Walker's Paradise: Daily errands do not require a car
70-89	Very Walkable: Most errands can be accomplished on foot
50-69	Somewhat Walkable: Some errands can be accomplished on foot
25-49	Car Dependent: Most errands require a car
0-24	Car Dependent: Almost all errands require a car

Score	Meaning of Bike Score
90-100	Biker's Paradise: Daily errands can be accomplished on a bike
70-89	Very Bikeable: Biking is convenient for most trips
50-69	Bikeable: Some bike infrastructure
0-49	Somewhat Bikeable: Minimal bike infrastructure

Highlights of cities' Walk Scores and Bike Scores include:

- Saint Paul receives a higher Walk Score than Maplewood, Landfall, Oakdale, and Woodbury due in part to a sidewalk grid that allows people to easily get to more destinations.
- Increasing the number of destinations such as grocery, pharmacy, or other retail stores near the stations would allow more daily trips to be completed on foot. This would in turn increase a city's Walk Score.
- Because there are many destinations accessible on foot, Union Depot receives the highest score of the Saint Paul stations.
- The bicycle network in Saint Paul is better developed than other corridor communities and its Bike Score is supported by the presence of some on-street bicycle lanes and relative flat landscape.
- Saint Paul's scores could be improved with the build out of a full sidewalk and bicycle network and additional destinations near the stations.
- Maplewood, Oakdale, and Woodbury receive lower Walk Scores as they have fewer sidewalks and fewer destinations within station areas.

Parking

For this HIA, parking is evaluated based on several assumptions about the impact of the physical form of a station area, which in turn affects whether walking or biking to destinations is an attractive option. The study methodology (Appendix A) explains these assumptions in detail.

Table 4 summarizes parking rules included in city comprehensive plans and zoning codes. This information helps to illustrate city policies that could affect the physical form of a station area, which could also limit the ability to walk or bicycle to destinations.

Table 4: Parking Policies for Gold Line BRT Cities (Page 1 of 2)

Assessment Criteria	Saint Paul	Maplewood	Landfall	Oakdale	Woodbury
Does the zoning code specify parking minimums?	Yes	Yes	Zoning code is not available	Yes	Yes
Does the zoning code specify parking maximums?	Surface lots with more than 15 spaces cannot exceed their parking minimum by more than 200% for restaurants and by 70% for other uses	Zoning for mixed-use districts specifies parking shall not exceed the specified minimum by more than 10%, or two spaces, whichever is greater	Zoning code is not available	No	No
Does the zoning code allow for the potential for no new parking at developer's discretion?	Discussed in the comprehensive plan, but not explicitly allowed in the zoning code	No	Zoning code is not available	No	No
Does the zoning code allow for reduced parking within a transit station area?	Yes, by 25% in Traditional Neighborhood (TN) districts. T3 and T4 districts (TN districts with highest intensity uses) may use on-street parking to meet requirements	For retail, medical, service and office uses, if a transit shelter is provided on site or in front of the building, then the minimum required number of parking spaces may be reduced by five percent but not to exceed five parking spaces total	Zoning code is not available	No	No
Does the zoning code allow for reduced parking with provision of bicycle parking or on-site car sharing?	Yes	No	Zoning code is not available	Reduction in parking requirements for employers with car pools is discussed in the comprehensive plan, but is not in the zoning code	Reduction in parking footprints through bicycle parking, shared parking, and structures is discussed in the comprehensive plan, but is not in the zoning code
Does the zoning code allow for shared parking between compatible uses?	Yes	Yes	Zoning code is not available	Yes	Shared parking is discussed in the comprehensive plan, but is not in the zoning code

Table 4: Parking Policies for Gold Line BRT Cities (Page 2 of 2)

Assessment Criteria	Saint Paul	Maplewood	Landfall	Oakdale	Woodbury
Does the city own municipal parking lots used for shared/district parking?	No	No	No	No	No
Does the city charge for street parking in any location within a Gold Line BRT station area?	Yes, in the Union Depot Station area only	No, though 3M charges employees for parking in certain facilities on their campus.	No	No	No
Does the comprehensive plan discuss design and location of parking lots with regard to visual impacts or pedestrian environment?	Yes	Yes, for mixed-use districts	No	Yes, in the mixed use area along 10th Street and in the Tanners Lake redevelopment site	Yes, in areas designated mixed-use underground or decked parking is encouraged to enhance pedestrian areas
Does the city allow on-street parking on local streets in its station areas?	Yes	Yes, on some streets	Yes	On-street parking is not explicitly prohibited, but it is not used. The comprehensive plan calls for encouraging off-street parking and prohibiting parking on arterial and collector streets	Yes, on-street parking is welcome in areas designated as neighborhood shopping centers
Does the city practice Travel Demand Management and use any tools to reduce single-occupancy-vehicle travel?	Yes	Yes	No	No	No

The follow is a summary of parking policies by city.

Saint Paul

- The City of Saint Paul sets parking minimums for all uses in its zoning code. The minimums are reduced by 100% for parcels within a quarter mile of the Central Corridor (METRO Green Line) Light Rail Transit on University Avenue. Minimums can be reduced when bicycle parking is available or parking is shared among uses.
- The zoning code specifies parking maximums that apply to developments where parking minimums are exceeded. The code specifies parking maximums by type of use.
- The zoning code also requires bicycle parking to be provided, and allows bicycle parking to replace up to 10% of off-street car parking.
- The City of Saint Paul requires large developments to provide set of strategies aimed at reducing the demand for roadway travel. These plans are called Travel Demand Management Plans (TDMPs).
- In the Union Depot station area, the city provides metered street parking, and off-street parking is provided in private facilities and priced by demand. There is no metered parking in the other Saint Paul Gold Line BRT station areas.
- In general, Saint Paul has put in place some measures to make better use of existing parking, though there are several actions the city could take to strengthen their position on parking outside of downtown, as discussed in the Connectivity Recommendations section.

Maplewood

- Maplewood is unique because the 3M campus makes up most of the station area. Accordingly, city parking policies, combined with any actions taken by 3M to further develop their campus, will shape the physical form of the station area before and after the station opens.
- 3M stated to the Gold Line BRT project team that they are have a shortage of parking available and have begun charging employees for parking in some locations on the campus in order to manage demand.
- 3M has long had a ridesharing program and maintains 24 employee-operated vans for carpooling. The company recently conducted a bicycle and pedestrian plan for its campus in effort to respond to staff interest to commute by those methods.
- Metro Transit's Employer Program may be able to provide 3M with resources to educate employees on transportation options and more efficiently use available resources.

Landfall

- The Landfall Comprehensive Plan provides no information on parking.

Oakdale

- The City of Oakdale zoning code sets parking minimums for all uses.
- There are no reductions for developments located in station areas. Currently, the Gold Line BRT project and its station locations are not included in the plan, as it was published before most

Gold Line BRT planning was underway. The upcoming comprehensive planning process provides the opportunity for the City of Oakdale to include the Gold Line BRT in the next plan.

- While a major shift away from driving is not expected in the near future and demand for parking will continue in Oakdale, the city should consider several measures to guide the location and design of new parking lots and explore sharing of existing parking between new and existing uses.

Woodbury

- The City of Woodbury zoning code sets parking minimums for all uses.
- There are no reductions for developments located in station areas. Currently, the Gold Line BRT project and its station locations are not included in the plan, as it was published before most Gold Line BRT planning was underway. The upcoming comprehensive planning process provides the opportunity for the City of Woodbury to include the Gold Line BRT in the next plan.
- While a major shift away from driving is not expected in the near future and demand for parking will continue in Woodbury, the city should consider several measures to guide the location and design of new parking lots and explore sharing of existing parking between new and existing uses.

Housing

Vision Statement

Increase housing options for all ages, incomes, and lifestyles.

Relationship to Health

The availability and affordability of a variety of housing options for people of all ages, levels of income, and lifestyles supports healthy communities. Households paying a larger portion of their income for housing often do not have enough money remaining to meet other essential needs. These households may be forced to decide between paying their mortgage or rent and buying food, medical insurance, and health care. Lacking resources to afford housing can lead to unstable conditions, including frequent moves, living in shared-spaces, eviction, foreclosure, and even homelessness. This sort of unstable housing situation can lead to high levels of stress and depression.

An area can also be unaffordable if getting to goods and services requires high transportation costs. According to the Center for Neighborhood Technology (CNT), planners, lenders, and most consumers consider housing affordable if the cost is 30% or less of household income. Research done by CNT across metro areas of varying sizes has found that spending 15% of income or less on transportation is affordable. Therefore, locations where combined housing and transportation costs are less than 45% of median household income are considered affordable to the typical household. This amount, known as Housing + Transportation Affordability Index (H+T Index), shows housing and transportation costs as a percentage of area median income—the median divides income distribution into equal parts with half falling below the median and half above the median—for the census blocks located near a location.

More information on the H+T Index is located in the section below (see Table 10 for more information on the H+T Index).

Research has shown that new transit investments can lead to increased land values and greater housing demand around the stations. As a result, individuals may pay more to live near transit. This increased demand pushes builders to provide new development and new types of housing such as apartments, condominiums, etc., often bringing in new residents to the area. As more people move into an area, existing residents, including those who are low-income or elderly, may not be able to afford housing in the area.

Community Input

Gold Line BRT community members commented that it is important to have affordable housing for all ages, income levels, and lifestyles in station areas. One community member said simply, "Access to affordable housing is a top social determinant of health." Social determinants of health are the physical and economic environments in which we live, work, and play. Housing, as an example, is the foundation for our daily lives. Where we live is where we sleep, store valuables, recover from illness, and raise our families. Our home and neighborhood conditions influence our ability to make healthy choices.

Existing Conditions

Affordable Housing in the Region

The importance of affordable housing in a healthy region is well-documented in the Twin Cities' regional planning and policy documents. The Metropolitan Council has prioritized creating "housing options that give people in all life stages and of all economic means viable choices for safe, stable, and affordable homes.[9]" The *2040 Housing Policy Plan* documents a growing need for more affordable housing in the region:

- **Demand for housing is growing**: Between now and 2040, the region will add 374,000 households. Roughly 40% of the households will earn less than 80% of area median income ($65,800 for a family of four).
- **People are paying too much for housing:** Households that pay more than 30% of their income on rent or mortgage are considered "housing cost burdened." This means that even with the existing supply of affordable housing, more than one-third or 265,000 low- and moderate-income households in the region are paying more than 30% of their household income on housing costs. Nearly 140,000 of those are paying more than half their income on housing.
- **More people will need affordable housing options**: The Metropolitan Council forecasts that between 2020 and 2030, our region will add 49,500 low- and moderate-income households who will need affordable housing. For comparison, in the first three years of this decade, the region added slightly fewer than 3,000 new affordable units; this is insufficient to meet the need.

Affordable Housing in Gold Line BRT Cities

The following section includes a brief summary of the affordable housing conditions in each Gold Line BRT community, as documented in their comprehensive plans. Percentages of affordable units at 80% area median income are presented by city in Table 5.

Table 5: Percentage of Affordable Units by Gold Line BRT City

City	Percentage of Housing Units Affordable to Low-Income Households*
Saint Paul	85.1% **
Maplewood	82.8%
Landfall	100.0%
Oakdale	71.8%
Woodbury	39.7%

*Low-income households are those with income at or below 80% of area median income.
**Regional Average = 65.9% Affordability[10]

Saint Paul

The *Saint Paul Comprehensive Plan* states that the number of households paying more than 30% of their incomes on housing expenses has increased sharply among both renters and owners from 1990 to 2005. Furthermore, American Community Survey data suggests that a majority of Saint Paul households would qualify for affordable housing, with more than 70% of residents earning incomes at or below the area median income. The area median income is the midpoint of a region's income distribution with half of households earning more than and half of household earning less than the median. As shown in Table 6, housing affordability has declined throughout Saint Paul, including Gold Line BRT communities.

Table 6: Percent of Saint Paul Households Spending More Than 30% of Income on Housing

	1990	2000	2005
Owner-occupied households paying at least 30% of their income on housing	18.3%	19.6%	33.9%
Renter-occupied households paying at least 30% of their income on housing	45.8%	41.9%	54.5%

Maplewood

The *2030 Maplewood Comprehensive Plan* notes that housing costs continue to rise throughout the region and commits the city, through its Housing and Redevelopment Authority, to explore all possibilities for financing affordable housing.

Landfall

The *Landfall Comprehensive Plan* notes the city contains approximately 300 lots for manufactured homes, with 98% of the lots leased by owner-occupied units. Residential density—a measure of the intensity with which land is occupied by either development or population—in Landfall is approximately

nine units per acre. Prices of manufactured housing units range from $10,000 to $60,000, and lot rentals in Landfall are $273 to $336 per month. Housing costs meet the Metropolitan Council's definition of affordable home ownership and affordable rental housing at 50% of the area median income. Landfall's policy is to preserve the affordable housing in the community.

Oakdale

The *2030 Oakdale Comprehensive Plan* notes that the Metropolitan Council allocated 184 additional units of new affordable housing to be constructed in the city between 2011 and 2020. This represents approximately 26% of growth, which is similar to the historic affordable housing ratio in Oakdale. The plan identifies plenty of capacity for housing on vacant land in the city.

Woodbury

Woodbury's affordable housing goal for the period 1996 to 2010 was 1,784 units (1,584 ownership and 200 rental units). A total of 2,174 affordable housing units (1,947 ownership and 229 rental) were built in Woodbury between 1996 and 2008. Almost one of every five housing units (19.4%) built during this period was affordable. To encourage affordable housing development, Woodbury used density bonuses in single-family and multifamily developments, financial incentives for developers, partnerships with organizations such as Twin Cities Habitat for Humanity, public purchase of land, tax exempt bonds, tax increment financing, waiving city fees, Housing and Redevelopment Authority loans, and federal Housing and Urban Development (HUD) funding.

Housing Assessment

Affordable New Housing Units

Affordable new housing units in each Gold Line BRT city are shown below in Table 7.

Table 7: Affordable New Housing Units

City	New Housing Units Affordable to Households Earning 60% of Area Median Income or Less							
	2010		2011		2012		2013	
	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental
Saint Paul	18	252	23	189	12	88	8	50
Maplewood	21	0	0	0	0	0	0	0
Landfall	0	0	0	0	0	0	0	0
Oakdale	8	29	2	39	1	0	1	0
Woodbury	57	28	9	0	0	45	10	0
Total	**413 units**		**262 units**		**146 units**		**69 units**	

Source: Metropolitan Council

Existing Affordable Housing Units

Affordable existing housing units in each Gold Line BRT city are shown below in Table 8.

Table 8: Affordable Existing Housing Units

Percentage of Existing Housing Stock Affordable to Households Earning:						
City	**30% of AMI* or Less**		**50% of AMI or Less**		**80% of AMI or Less**	
	2010	**2014**	**2010**	**2014**	**2010**	**2014**
Saint Paul	14	13	55	48	86	82
Maplewood	12	8	36	23	83	74
Landfall	100	100	100	100	100	100
Oakdale	6	4	38	20	88	66
Woodbury	1	1	18	6	51	37

Source: Metropolitan Council
* AMI is area median income

In general, the percentage of units affordable to households earning 30, 50, and 80% of area median income is declining in all of the Gold Line BRT communities, indicating that fewer homes are affordable to low-income households. Landfall is unique as 100% of its housing is affordable to households earning less than 30% of area median income. Within the last five years in Woodbury, only 2% of housing is affordable compared to households with less than 30% of area median income.

Housing Performance Scores

The Housing Performance Score is calculated on an annual basis for each of the region's cities and townships. It assesses local efforts to develop and maintain affordable housing and support low- and moderate-income households through a variety of programs and services. The Metropolitan Council uses the scores to prioritize funding to communities that are maintaining or expanding their supply of affordable housing and using fiscal, planning, and regulatory tools to promote affordable and mixed-income housing. The Housing Performance Score is calculated out of 100 available points from four main areas:

- Recent or new construction projects completed in the last 10 years (0-35 points)
- Recent preservation projects in last 10 years or substantial rehabilitation in last 3 years (15-50 points)
- Housing programs and policies in place and in use in the last 5 years (0-25 points) and
- Characteristics of the existing housing stock (0-25 points)

A score of 0 indicates a lack of any housing activity and 100 reflects outstanding performance in meeting affordable housing goals, providing housing-related services, and approving and contributing to housing development, redevelopment, rehabilitation, and preservation.

Housing performance scores for the last five years are shown below in Table 9. The Metropolitan Council uses housing performance scores to prioritize funding to communities maintaining or expanding

affordable housing and using monetary, planning, and regulatory tools to promote affordable housing. The Metropolitan Council uses the score in two of its three Livable Community Act programs to reward high-scoring communities demonstrating a commitment to providing affordable housing. Local housing performance scores are also used to score transportation funding applications through a competitive application process with the Metropolitan Council (called the Regional Solicitation program).

Table 9: Housing Performance Scores for Each Gold Line BRT City

City	Housing Performance Score					
	2010	**2011**	**2012**	**2013**	**2014**	**2015**
Saint Paul	96	96	95	98	98	100
Maplewood	89	70	62	58	55	81
Landfall	20	23	18	23	24	25
Oakdale	70	79	77	76	74	89
Woodbury	79	83	84	80	78	88

Saint Paul consistently has the highest housing performance score of the Gold Line BRT communities. Oakdale and Woodbury also score well.

Housing Cost Burden

The H+T Index for each Gold Line BRT community is presented below in Table 10. The H+T Index for each station is also included. The index was obtained for the census block group in which the station would be located. Census block group is the smallest unit in which the information is available.

Table 10: Housing + Transportation Costs as a Percentage of Income

City and Station Location	Housing	Transportation	Total
Saint Paul	**22%**	**20%**	**42%**
▪ Union Depot	19%	14%	33%
▪ Mounds Boulevard	15%	16%	31%
▪ Earl Street	14%	17%	31%
▪ Etna Street	21%	18%	39%
▪ White Bear Avenue	19%	17%	36%
▪ Sun Ray	19%	18%	37%
Maplewood	**26%**	**20%**	**46%**
▪ 3M	22%	20%	42%
Landfall/Oakdale	**26%**	**19%**	**45%**
▪ Greenway Avenue	26%	19%	45%
Oakdale	**25%**	**19%**	**44%**
Woodbury	**33%**	**20%**	**53%**

Using the H+T index, the combined costs of housing and transportation are less than 45% of household income in the station areas for Saint Paul, Maplewood, and Landfall. The Center for Neighborhood Technology considers locations where combined housing and transportation costs constitute less than 45% of median household income to be affordable for the typical household.

Overall, the Saint Paul station areas are the most affordable places to live in the corridor, based on current conditions. However, as Saint Paul states in their comprehensive plan, the city as a whole is becoming less affordable to residents. Housing costs and transportation costs are higher in the suburban communities than in the east side neighborhoods of Saint Paul. Landfall's results likely under-estimate the number of cost-burdened households due to inclusion of two higher-income census tracts to the north.

Jobs

Vision Statement

Increase the number and variety of jobs available along the Gold Line BRT.

Relationship to Health

Steady employment has a direct positive impact on health. A well-paying job makes it easier for workers to live in healthier neighborhoods, provide quality education for their children, secure child care services, and buy food that is more nutritious. Stable employment leads to higher income, and people with higher incomes are less likely to be in fair or poor health. In contrast, those who are unemployed are more likely to develop stress-related conditions such as stroke, heart attack, heart disease, or arthritis. Similar links are present for mental health conditions. Moreover, the unemployed and underemployed are more likely to delay seeking medical care, including preventive care, thus prolonging health conditions[11]. Those who are employed but classified as "working poor" have similar health challenges.

Transportation is one of many factors affecting a person's employment and the type of job they hold. Because jobs are located throughout the region, workers with limited car access may find it difficult and expensive to reach potential jobs. Increasing transit connections to jobs throughout the region expands employment options. Locating jobs near transit stations creates job opportunities for workers, particularly transit-dependent individuals, and opens a larger labor pool for employers. As the Gold Line BRT is built, it is possible to improve employment for area residents and improve health outcomes.

Community Input

Job Access

Gold Line BRT community members commented that jobs in the station area can benefit residents, employees, and the transit service. They further commented that it is important to have entry-level and living wage jobs. A living wage is the amount needed for a worker to afford the cost of living in their community. Well-paying jobs support better health as workers can afford healthier neighborhoods, quality education for their children and themselves, childcare services, and more[12]. Since jobs are spread throughout the metro area, transit connections improve a person's ability to get to stable, well-paying jobs.

Existing Conditions

Unemployment and Underemployment

Table 11 compares the employment rate in each municipality to the regional average. Saint Paul has the highest unemployment rate among the corridor communities. Today, Woodbury has the lowest unemployment rate among the corridor communities, and is the only city whose rate is lower than the regional average. All other Gold Line BRT cities have rates higher than the regional average of 3.6%.

Table 11: Unemployment Rates in Gold Line BRT Cities

City	Municipal Unemployment Rate (2015)	Regional Unemployment Rate	Status
Saint Paul	4.0%	3.6%	City performs poorer than regional average
Maplewood	3.9%	3.6%	City performs poorer than regional average
Landfall	Not Available	3.6%	City performs poorer than regional average
Oakdale	3.7%	3.6%	City performs slightly poorer than regional average
Woodbury	2.8%	3.6%	City performs better than regional average

Source: MN DEED Local Area Unemployment Statistics

While employment status provides a snapshot of the workforce in the Gold Line BRT area, wages and hours worked also affect an individual's quality of life and the overall economic health. The unemployment rate in the seven-county region is among the lowest in the United States, but the rate does not show problems with underemployment. Slow income growth coupled with lower unemployment rates is indicative of underemployment. Earnings growth is used as a substitute for underemployment. Table shows earning trends for Gold Line BRT communities.

Table 12: Earnings Trends (2014 Dollars)

City	2010 Median Household Income	2013 Median Household Income	Percent Change	Status
Saint Paul	$48,095	$47,864	- 0.5%	Performs better than regional average
Maplewood	$56,020	$61,583	+ 10.0%	Performs better than regional average
Landfall	$35,284	$32,724	- 7.2%	Performs below regional average
Oakdale	$71,980	$68,890	- 4.2%	Performs below regional average
Woodbury	$96,949	$98,370	+1.5%	Performs better than regional average
Metro Area	***$69,374***	***$67,578***	***- 2.6%***	

Source: American Community Survey 3-Year Estimates 2010-2013 adjusted for inflation to 2014 dollars

Overall, median household income trends for the seven-county metro area indicate a 2.6% decline in purchasing power, the financial ability to purchase goods and services. This finding suggests that even as unemployment rates dropped and more people were working, wages were stagnant or declining or

people were working fewer hours. Three communities along the Gold Line BRT performed better than the regional average (i.e., Saint Paul, Maplewood, and Woodbury), with Maplewood performing considerably better than the region as a whole with 10% growth in household income. Oakdale performed marginally below the regional average, and Landfall had the greatest decline (7.2%) in median household income.

Industrial Diversity

A diverse economy is better at bouncing back in tough economic times and has the ability to meet the needs of people with a variety of skills and capabilities. Having more economic sectors (e.g., manufacturing, agriculture, service, etc.) represented in a geographic area can increase the likelihood of employment for individuals entering the labor force. Data from the Metropolitan Council's community profile[13] was used to compare the industrial diversity (see Table 13) for each Gold Line BRT community.

Table 13: Industry Diversity in Gold Line BRT Communities

City[14]	Total Jobs (2014)	Top 3 Industries	Industrial Diversity*
Saint Paul	177,010	Health Care/Social Assistance (23%) Public Administration (13%) Educational Services (10%)	18
Maplewood	29,041	Other Industries (41%) Health Care/Social Assistance (17%) Retail Trade (15%)	13
Landfall	25	Not Available	Not Available
Oakdale	9,975	Retail Trade (14%) Accommodation/Food Services (13%) Health Care/Social Assistance (10%)	17
Woodbury	21,278	Retail Trade (23%) Health Care/Social Assistance (20%) Accommodation/Food Services (12%)	16

*Industrial diversity is measured by the number of industries that hold a 1% or greater share of that city's workforce. A greater number indicates more industrial diversity, as the workforce is distributed across more industries.
**Economic sectors that individually make up less than 1%of the jobs in the city.

In general, the Gold Line BRT communities are comprised of health care, social assistance, retail, accommodation, and food service jobs. Economies between Gold Line BRT cities are diverse. For example, the City of Saint Paul has the greatest diversity of industries whereas Maplewood has the least.

Poverty Status

In addition to weighing down the regional economy, poverty status affects health in a variety of ways. Those in poverty and the working poor experience challenges finding work and obtaining health care and insurance benefits, and are affected by stress-related illnesses. Table 14 compares households in poverty within a half-mile of the Gold Line BRT station areas to overall poverty levels at the city, county, and regional level.

Generally, the population around Gold Line BRT station areas has higher rates of poverty compared to their surrounding communities, counties, and region. Saint Paul station areas have the highest share of populations with incomes below poverty level, followed by Woodbury and Landfall.

Table 14: Households in Poverty by Station Area

City and Station Location	Percent Below Poverty	Status
Seven-County Region	**11%**	
Gold Line BRT	**17%**	
Ramsey County	**17%**	
Saint Paul	**23%**	
Union Depot	18%	Station area has a lower share in poverty than the city as a whole, and a higher share than Ramsey County and the seven-county region
Mounds Boulevard	35%	Station area has a higher share in poverty than the city, Ramsey County, and the seven-county region
Earl Street	29%	Station area has a higher share in poverty than the city, Ramsey County, and the seven-county region
Etna Street	30%	Station area has a higher share in poverty than the city, Ramsey County, and the seven-county region
White Bear Avenue	15%	Station area has a lower share in poverty than the city, Ramsey County and the seven-county region
Sun Ray	15%	Station area has a slightly lower share in poverty than the city, Ramsey County, and the seven-county region
Maplewood	**6%**	
3M	21%	Station area has a higher share in poverty than the city, Ramsey County and the seven-county region
Washington County	**6%**	
Landfall	**8%**	
Greenway Avenue	14%	Station area has a higher share in poverty than the city, Washington County, and the seven-county region
Oakdale	**3%**	
Woodbury	**10%**	

Source: American Community Survey 5-Year Estimates 2010-2014

Jobs Assessment

Projected Employment Growth

The Metropolitan Council's *Transportation Policy Plan* (TPP)[15] outlines regional policies that link transportation decisions to land use and local planning. It provides specific guidance for local plans, calls for coordination between land development and transportation, and describes the benefits of locating job concentrations along major transportation corridors. These actions contribute to regional objectives for reducing air pollution, mitigating congestion, and reducing the costs for operating, maintaining, or improving infrastructure. The TPP indicates that a combination of 7,000 residents, jobs, students, or

people going to retail or entertainment destinations should be located within a ten-minute walk or half-mile of a transitway station. Table 15 compares only the job and residential populations across the stations to the regional standard of 7,000. These calculations do not take into account other types of activities in station areas, like students or retail customers, because that information is not readily available by station type.

Table 15: Existing and Forecasted Population and Employment by Station Areas

	Station Area Population		Station Area Employment		Station Area Activity (Jobs + Population)		
Station	**Existing**	**2040**	**Existing**	**2040**	**Existing**	**2040**	**Assessment (based on residential and employment numbers only)**
Union Depot	4,274	14,591	27,119	31,568	31,393	46,159	Current and future station area activity **meets regional threshold**
Mounds Boulevard	3,813	3,932	1,170	5,623	4,983	9,555	Future station area activity **meets regional threshold**
Earl Street	5,772	5,555	446	5,788	6,218	11,343	Future station area activity **meets regional threshold**
Etna Street	4,992	4,864	573	4,998	5,565	9,862	Future station area activity **meets regional threshold**
White Bear Avenue	4,856	5,891	1,766	6,457	6,622	12,348	Future station area activity **meets regional threshold**
Sun Ray	5,506	7,193	2,666	7,565	8,172	14,758	Current and future station area activity **meets regional threshold**
3M	747	1,150	8,284	9,279	9,031	10,429	Current and future station area activity **meets regional threshold**
Greenway Avenue	2249	2,413	350	1,857	2,599	4,270	Current and future station area activity **does not meet regional threshold**

Based on 2040 Metropolitan Council forecasts, Union Depot, Sun Ray, and the 3M Stations currently meet the regional activity thresholds, and will continue to do so in the future. The next strongest performing stations for residential and employment activity units are those anticipated to meet the threshold in the future including the remainder of the Saint Paul station areas (i.e., Mounds Boulevard, Earl Street, Etna Street, and White Bear Avenue). The Greenway Avenue Station is the only station that does not meet the 7,000 activity unit threshold by using just residential and employment data.

Employment Density

Accessibility to jobs via transit is an important measure of the benefit of a transit service. Employment densities (see Table 16) within a half-mile of each station consist of a wide range of densities per acre.

Union Depot has the strongest concentration of jobs, followed by 3M. The remaining station areas average approximately 12 jobs per acre.

Table 16: Employment Density in Gold Line BRT Station Areas

Station	Jobs per Acre (2010)
Union Depot	90.7
3M	33.3
Sun Ray	19.1
Mounds Boulevard	16.1
White Bear Avenue	15.5
Earl Street	14.8
Etna Street	11.5
Greenway Avenue	7.7

Transit Access to Jobs

An inventory of current transit service (Table 17) at each station helps determine how effectively people can travel by transit. The level of accessibility at each station can be established by considering the availability of transit at each station. Stations with more transit service are more likely to have connections to regional job centers.

Table 17: Existing Transit Connections to Gold Line BRT Station Areas

Station	CBD * Connection	Transit Connection to Gold Line	Hi-Frequency Network	Express Service	Urban Local Service	Sub. Local Service	Peak Service	Midday Service	Night Service
Union Depot	*Minneapolis & Saint Paul*	*Yes*	*Yes*	*Yes*	*Yes*	*N/A*	*Yes*	*Yes*	*Yes*
Mounds Boulevard	*Minneapolis & Saint Paul*	*Yes*	*No*	*No*	*Yes*	*N/A*	*Yes*	*Yes*	*Yes*
Earl Street	*Saint Paul*	*Yes*	*No*	*No*	*Yes*	*N/A*	*Yes*	*Yes*	*Yes*
Etna Street	*Saint Paul*	*Yes*	*No*	*No*	*Yes*	*N/A*	*Yes*	*Yes*	*Yes*
White Bear Avenue	*Saint Paul*	*Yes*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Sun Ray	*Saint Paul*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
3M	*Saint Paul*	*Yes*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Greenway Avenue	*No*	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*

*CBD=Central Business District

Station areas in and near Saint Paul benefit from the greatest degree of regional transit access; Union Depot and Sun Ray are major transit transfer points served by multiple local, express, and transitway routes. The majority of transit routes in the region serve downtown Minneapolis and downtown Saint

Paul, the region's largest employment centers. A direct link to these locations is critical for job access and connectivity to the greater region.

Other stations outside Saint Paul have a mix of local and express transit services, typically with connections to downtown Saint Paul. The 3M and Greenway Avenue Stations are served by one suburban local route 219 that has service frequencies around 20 minutes during the peak periods and up to 60 minutes in the mid-day and evening.

Economic Development Initiatives

The 2030 comprehensive plans were reviewed to identify each city's policies or guidance regarding economic development initiatives at station areas. However, it is important to recognize the comprehensive plans were updated in 2008 before Gold Line BRT planning had begun. In that respect, the comprehensive plans were also assessed to determine their support for job creation through economic development initiatives.

In addition to the comprehensive plans, a Gold Line BRT real estate market analysis[16] was conducted in 2014. The market analysis also provided insight regarding near-term (one to five year) real estate development prospects in each station area. Results of this analysis are included in each city's assessment below. High-level results of the market analysis include:

- **There is growing and unmet demand for walkable, mixed-use communities.** More than half of Minnesotans prefer to live in a mixed-use neighborhood with diverse housing, retail, and amenities within walking distance. Within the Twin Cities, there is unmet demand for small-lot single-family homes and attached housing combined with an oversupply of 22,000 for all other homes, including traditional large-lot homes.[17]
- **There is unmet demand for new housing, particularly in the form of single-family attached townhomes.** Townhomes and small-lot single-family homes provide many of the same benefits as mid-rise multifamily housing, and are cheaper to build than mid-rise multifamily housing. Mid-rise multifamily development is not yet feasible outside of downtown Saint Paul without incentives in the near-term. In addition, current sales prices can support new construction as evident by the growing presence of townhomes.
- **Regional employers recognize the importance of transit for employee recruitment and retention.** Employers in the Twin Cities report that transit access is good for recruiting new talent, particularly skilled young professionals.[18] Firms often consider transit access when considering a new location and prioritize sites that provide both auto and transit access. 3M, the largest employer in the corridor, has indicated that the Gold Line BRT will be beneficial for recruiting and retaining new talent and envisions a convenient and attractive walking and bicycling environment from their campus buildings to the transitway.

Lastly, the City of Saint Paul conducted a station area planning process between May 2014 and June 2015 in tandem with the Gold Line BRT Draft Environmental Impact Statement (EIS). The station area plans were adopted by the Saint Paul Planning Commission and City Council in October 2015, and serve as an update to the city's comprehensive plan. The plans take the place of the Sun Ray-Suburban Small

Area Plan. Because of this relationship with existing plans, the station area plans were the primary document reviewed for Saint Paul.

The Maplewood, Landfall, and Oakdale station area plans are high-level preliminary planning documents. Planning commissions or city councils have not acted on the plans, which were created as informational documents for future planning efforts. Thus, the review of these cities' economic development efforts is based only on the contents of their comprehensive plans.

Saint Paul

The station area planning process included the formation of the Gold Line Station Area Planning Task Force, which consisted of ten members, including nearby business owners, residents, and two Saint Paul Planning Commissioners. The Task Force focused on land use, development, open space, walking and bicycle connections, and access to five potential Saint Paul stations on the Gold Line BRT (i.e., Mounds Boulevard, Earl Street, Etna Street, White Bear Avenue, and Sun Ray).

The adopted station area plans integrated two primary goals related to job growth on the Gold Line BRT. These goals are:

- Create opportunities for new development and redevelopment for residents attracted by the BRT service, and build destinations and community resources.
- Create opportunities for existing businesses to benefit from transit.

Find more information on the Saint Paul *Gold Line Station Area Plans* document at http://www.stpaul.gov/GoldLineSAP.

UNION DEPOT

Future land use near Union Depot presents moderate opportunities to support job growth in the area. Planned land uses near Union Depot are similar to existing uses including industrial, high-density residential, and mixed-use. Primary redevelopment opportunities to support job growth in the station area are located north of Kellogg Boulevard between 4th and 5th Streets.

MOUNDS BOULEVARD STATION

Mounds Boulevard Station has limited opportunities to support job growth in the area due to the existing development and the commitment to historic preservation. The market analysis for this station area noted that potential may exist for convenience retail or redevelopment in the medium- or long-term, leveraging the station's proximity to Metro State University and downtown Saint Paul. There is also the potential for infill residential development, the process of developing vacant or underused lots in mostly developed areas. Over the next five years, there is limited market potential and physical feasibility for new development.

EARL STREET STATION

The market analysis noted that over the next five years, there might be opportunities for adaptive reuse of buildings along Hudson Road. In the medium- to long-term, there is potential for infill residential and convenience retail development, which may require public- and private-sector collaboration due to the relatively high cost of redevelopment.

Earl Street Station has moderately limited opportunities to support job growth in the area. The station area plan recommended investing in the area to preserve the integrity and character of the residential neighborhood, rehabilitating the existing commercial buildings, and filling in the gaps within the commercial area with mixed-use buildings and residential uses.

ETNA STREET STATION

The market analysis for this station area noted near-term development is limited by current uses, but may be feasible on vacant lots near the proposed station. Redevelopment will likely be challenging in the medium- to long-term as it will require significantly higher rents to make up for the cost of demolition, lost income during the construction period, and cost of new construction.

The Etna Street Station Area Plan and future land use present moderate opportunities to support job growth in the area. The station area plan recommends land use changes occur immediately around the Etna Street Station through the creation of new developable land because of interchange reconfiguration, and the eventual redevelopment of the business park at the northwest corner of Etna and Wilson.

WHITE BEAR AVENUE STATION

The market analysis for this station area noted the proposed location provides an immediate opportunity for mixed-use development. Redevelopment of existing sites over time may be feasible as residential rents increase supporting redevelopment.

The White Bear Avenue station area plan and future land use presents significant opportunities to support job growth in the area. With the larger vacant lots and underused parking lots, this station area holds some of the East Side's best opportunities for a new development designed to support businesses and the transit service itself.

SUN RAY STATION

The market analysis for this station area noted that in the near-term, Sun Ray is unlikely to be redeveloped. However, there may be medium- to long-term potential for full or partial redevelopment of the center as tenant leases expire and residential values can justify the cost of redevelopment.

The Sun Ray Station Area Plan and future land use presents significant opportunities to support job growth in the area. Nowhere else along the Gold Line BRT in Saint Paul is there a larger contiguous group of one-story buildings and parking lots than at the Sun Ray Station. The area near the proposed

BRT station and park & ride lot present tremendous potential for large-scale development in the medium- to long-term. In the short-term, the market analysis shows retail demand is high, while multi-family residential demand is medium. Changes to the land uses and intensity of the existing commercial developments will need to be phased, and driven by the private sector. Established residential areas will maintain their existing character.

Maplewood

Maplewood's comprehensive plan supports efforts by other agencies to improve transit service in the city on arterial roadways, which are high capacity urban roads helping move traffic to and from the interstate. The city will encourage higher-density economic development and redevelopment as transitways are added to arterial roads. The comprehensive plan also notes the city should coordinate its sidewalk and trails plan to encourage travel on foot, bicycle, and bus. Furthermore, Goal 3 of the Land Use chapter encourages more intense development and redevelopment along existing transit corridors, which supports job creation.

The market analysis for the 3M station area in Maplewood noted that 3M anchors the local real estate market through its own spending and the spending of its employees and visitors. There could be a market for townhomes near the campus, and new convenience or destination retail on the 3M campus. However, 3M has no immediate plans for additional development or new office space on their campus.

Landfall

The comprehensive plan notes the city will continue to work with Metro Transit providers to increase the variety of transit destinations available to residents, who will be directly served by the Greenway Avenue Station.

The market analysis for the Greenway Avenue Station notes that new development in this station area will be dependent on the availability of suitable lots, and would likely be limited to residential use and retail over the next five years. The uses could benefit from the existing traffic to nearby retailers.

Oakdale

The City of Oakdale's comprehensive plan identifies multiple re-development goals, including Goal 2: **"**Realize high quality redevelopment opportunities that are functionally and aesthetically compatible with their surrounding uses," including transit and transportation land uses.

Woodbury

The City of Woodbury's comprehensive plan is supportive of mixed-use development, both new and infill. Although the 2030 plan does not place these areas near the Gold Line BRT, the plan does include a goal to "use transit-oriented design principles for future development where appropriate." This goal indicates that design should be carefully considered in areas with transit service.

Supportive Resources

A need for social assistance and health outcomes are linked to one's employment status. Therefore, this assessment includes an inventory of centers along the Gold Line BRT that provide food, shelter, and other types of support. This is not intended to be a study of these resources. Rather, it is an acknowledgement that access to these resources by transit is important, as they present potential paths to employment and improved health outcomes for people in need. Overall, resources are much more broadly available to those in poverty in Saint Paul compared to suburban communities in the corridor. Table displays resources for Gold Line BRT communities.

Table 18: Shelter and Food Shelf Resources by Community

Community	Food Shelves	Shelter/Emergency Housing	Notes
Saint Paul	• Saint Paul is home to over 40 community food shelves. • Dorothy Day Center is located downtown	• Union Gospel Mission • Naomi's Family Center • Catholic Charities Dorothy Day Center • Listening House of Saint Paul • Minnesota Assistance Council	All shelters are located within proximity to Gold Line BRT (Union Depot and Mounds Boulevard Stations)
Maplewood	• Salvation Army Lakewood – Maplewood Emergency Food Shelf	• Catholic Charities of Minnesota – Family Service Center, Maplewood	Food shelf located near I-694 and northern border of Maplewood
Landfall	• N/A	• N/A	N/A
Oakdale	• N/A	• N/A	N/A
Woodbury	• HOPE Harbor • New Life Food Shelf	• HOPE Harbor (transitional housing)	N/A

In addition to the food and shelter resources outlined in Table 18, this inventory includes Community Action Partnership (CAP) agencies, affordable housing resources, and other services dedicated to reducing and eliminating poverty. Resources available throughout corridor communities and counties include:

- Community Action Partnership of Ramsey and Washington Counties: The Community Action Partnership (CAP) of Ramsey and Washington Counties, similar to many CAP agencies, was created to help those in need, assist people with paying bills and expenses, provide grants and other emergency short term financial aid, assist individuals with finding jobs, and promote self-sufficiency.
- HousingLink: HousingLink is a web-based non-profit organization and resource available to anyone with internet access. The HousingLink website provides a comprehensive database of affordable housing properties throughout the region, and is a useful, consolidated resource for those looking to locate or relocate in the region.
- Metro Housing and Redevelopment Authority: The Metro Housing and Redevelopment Authority (HRA) is an affordable housing resource and provider for the Twin Cities seven-county metropolitan area, including Gold Line BRT communities in Ramsey County outside of Saint Paul

(i.e., Maplewood). Maplewood residents may use the Metro HRA's services, provided through the Metropolitan Council, to locate and obtain affordable housing assistance.

- Saint Paul Public Housing Authority: The Saint Paul Public Housing Authority provides help with housing costs to individuals and families through a variety of state and federal rental assistance programs in the city of Saint Paul. Income-eligible residents may apply for affordable housing assistance.
- Washington County Housing and Redevelopment Authority: The Washington County HRA provides help with housing costs to 650 families through a variety of state and federal rental assistance programs. Income-eligible residents of Washington County may apply for affordable housing assistance.

Ramsey County and Washington County have WorkForce Centers located in Saint Paul and Woodbury respectively. Operated by the Minnesota Department of Employment and Economic Development, WorkForce Centers offer counseling, computer access, office equipment, library services, assistive technology, and vocational training for those actively engaged in a job search. They also provide placement services for veterans and people with disabilities in partnership with other state and federal agencies. Additionally, WorkForce Centers offer assistance to businesses by linking them with prospective employees, business development consultant services, economic data, and labor market analyses.

Safety Assessment

Vision Statement

Create safe places for walking and bicycling, while reducing crime.

Relationship to Health

Crash rates and accident levels have shown the design of our built environment has not done enough to protect pedestrians and bicyclists. Historically we built our streets (including sidewalks) and intersections to help cars travel quickly between destinations with little focus on walkers and bicyclists. As a result, walking and bicycling have become less safe over time. Often the most frequent users of sidewalks and bicycle routes are individuals without other transportation options.

Providing a built environment with pedestrian- and bicycle-friendly design is important to safety. The same elements (e.g., street lighting and landscaping) that create welcoming spaces help promote safety both from accidents and from crime. Research has also shown having more people present in an area helps to deter crime. In addition, these spaces, when designed for both people and cars, can help create a sense of belonging and promote healthy behaviors, like physical activity. Well-designed spaces can help meet the diverse needs of the population.

In the Gold Line BRT, personal safety and crime prevention were among the elements perceived as having the greatest influence in creating healthier environments. Community members commented that if they do not feel safe, they are far less likely to use transit. Community members also listed the

importance of having good lighting and a variety of services available at the station areas to create more activity on the street.

Community Input

This assessment responds to two types of safety issues identified by community members: safety from crime and safety while traveling by foot or bicycle around transit stations.

Safety from Crime

Gold Line BRT community members perceive personal safety and crime prevention as having great influence in creating healthier environments. Community members commented that if they do not feel safe, they are far less likely to use services like transit. Community members also noted the need for good lighting to help people feel safe using sidewalks and other public spaces. Spaces with a lot of activity deter crime.

Safety While Traveling

In addition to personal safety, respondents also commented on the importance of safely traveling to and from stations and other local destinations. The design of the environment shapes actual and perceived safety. For example, respondents noted the need for complete and well-maintained sidewalks, good lighting, and easy access to destinations to help them feel safe. Respondents overwhelmingly selected sidewalks as an essential factor to traveling safely and for healthy communities.

Existing Conditions

Safety from Crime

This HIA concentrates on environments that deter criminal activity and help people feel safe, as opposed the type and amount of crime occurring in a given area along the Gold Line BRT. Spaces that enable crime and feel unsafe exist in every urban, suburban, and rural community, and are a product of visual, audible, or sensory environmental cues.

Safety While Traveling

The number of crashes in a community is one indicator of safety conditions in a given area. In this case, vehicular crashes with pedestrians and bicyclists are present within the corridor (see Table 19). However, the data should be interpreted with caution. Some areas lack adequate walking and bicycle facilities, or have few destinations accessible by foot or bicycle. In these areas, the lack of crashes may indicate an absence of pedestrians and bicyclists rather than a safe walking or biking environment.

Table 19: Vehicular Crashes Involving Pedestrians and Bicyclists in the Gold Line BRT Communities 2009-2013[19]

City	Total Crashes	Severity				
		Fatality	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Property Damage
Saint Paul	119	2	10	30	73	4
Maplewood	1	1	0	0	0	0
Landfall	1	0	0	1	0	0
Oakdale	2	0	1	1	0	0
Woodbury	2	0	0	0	2	0

Per-user crash rate can help determine whether certain areas are particularly unsafe. However, few walking and bicycle counts have been conducted in the corridor. In that respect, few data points exist on the number of pedestrians and bicyclists who use streets in the corridor. Additionally, data on crashes between pedestrians and bicycles with cars is determined from police reports. In some cases, these accidents are simply not reported or are reported only as property-damage incidents.

Available bicycle and pedestrian counts for the HIA include totals by Saint Paul in 2013 and 2014. However, the counts were completed in just two locations near the Gold Line BRT, and reflect the number of bicyclists and pedestrians during a two-hour peak period (see Table 20).

Table 20: Bicyclists and Pedestrians Counted in Saint Paul in 2013 and 2014

Location	Bicycles		Pedestrians	
	2013	**2014**	**2013**	**2014**
Johnson Parkway north of East Margaret Street	22	23	15	12
Kellogg Boulevard east of Broadway Avenue	N/A	33 (with off-street path closed)	N/A	156 (with off-street path closed)

Based on available data, crashes in Saint Paul far outnumber those in the other Gold Line BRT communities. There are a couple possible reasons for this finding. First, there are lower rates of automobile ownership in Saint Paul neighborhoods near the Gold Line BRT, which suggest that residents of these neighborhoods are more likely to take trips on foot, bicycle, or transit. In addition, there are likely more bicyclists in Saint Paul compared to other Gold Line BRT communities, due to the greater availability of bicycle facilities.

Safety Assessment

The assessment includes details on the policies presented in each of the city's comprehensive plans that may support crime prevention and pedestrian and bicycle safety. The assessment also evaluates the existing walking and bicycling conditions within the corridor, as well as the policy support for improvements to these networks.

Safety from Crime

Good design takes into consideration the built environment including buildings, roads, and sidewalks and how these elements influences safety. For example, people feel safer when there are many people walking on the street and business entrances are visible from the street. A good design policy called "Crime Prevention Through Environmental Design (CPTED)" incorporates building design, landscaping, and street design to invite more people to use public areas and help eliminate spaces where crime can occur.

Using the following criteria, this section evaluates the extent to which each community has planned for and implements CPTED principles:

1. The comprehensive plan references CPTED or its principles by name.
2. The comprehensive plan references the importance of lighting, landscaping, or fencing to crime reduction or feelings of safety and security.
3. The comprehensive plan references the importance of casual observance from buildings, or a sense of enclosure from the built environment contributing to feelings of safety.

Results of the assessment are shown in Table 21.

Table 21: Safety from Crime Evaluation

City	CPTED by Name	Importance of Lighting, Landscaping, or Fencing	Importance of Buildings' Relationship to the Street
Saint Paul	Yes (Land Use Chapter)	Yes, with regard to general streetscape improvements	Yes (Land Use Chapter)
Maplewood	No	Yes, with regard to building design standards	No
Landfall	No	Yes, with regard to attractive streets and safety	No
Oakdale	No	No	Yes, but only in reference to 10th Street
Woodbury	Yes (Housing Chapter)	Yes, in mixed-use areas	Yes, only in mixed-use and neighborhood shopping center areas

Only Saint Paul and Woodbury mention CPTED specifically in their comprehensive plans. However, most Gold Line BRT cities generally attribute safety to good lighting, attractive landscaping, and the general appeal of the street.

Safety While Traveling

Using the following criteria, this section evaluates each community's policies and plans in support of elements that facilitate safe travel on foot or by bicycle:

1. The comprehensive plan emphasizes the importance of the sidewalk network as a basic function of accessibility and increased pedestrian activity.
2. The community has a well-developed pedestrian network.

3. The community has a well-developed bicycle network planned or in place.
4. The municipality or county has a Complete Streets policy.
5. The comprehensive plan addresses the need for maintenance of these facilities over time and especially in winter.
6. The comprehensive plan recognizes the role of design in addressing vehicular speed and how vehicular speeds translate to safety for non-motorized users of the street.
7. The comprehensive plan calls for pedestrian-scale lighting, especially in transit station areas, downtown retail districts, or other areas where there are many pedestrians.

Results of the assessment are shown in

Table 22, with further detail provided in the following sections.

Table 22: Safety While Traveling Evaluation

City	Importance of Sidewalk Network*	Development of Sidewalk Network	Development of Bicycle Network	Complete Streets Policy	Maintenance of Bicycle and Pedestrian Facilities	Street Safety for All Users	Pedestrian -Scale Lighting
Saint Paul	Yes	Mostly developed	Developing	Yes	Yes	Yes	Yes
Maplewood	Yes	Fragmented	No bicycle network	Yes	Yes	Yes	Yes
Landfall	No	Mostly developed	No bicycle network	No	Yes	No	No
Oakdale	Yes	Fragmented	Developing	No	Yes	Yes, only on design ated bicycle routes	No

*In the areas of the city within approximately one-half mile of the Gold Line BRT transitway.

SAINT PAUL

The City of Saint Paul's pedestrian network is better developed than other Gold Line BRT communities and its bicycle network is growing. The *Gold Line Station Area Plans* call for sidewalks on both sides of the streets within a half-mile of stations, repair of uneven sidewalks, and good lighting for pedestrians in the station areas[20]. The station area plans also call for zoning changes consistent with implementation of high-quality pedestrian and bicycle networks.

MAPLEWOOD

Though Maplewood's pedestrian and bicycle networks are currently incomplete, the city is well-positioned to make positive changes for bicyclists and pedestrians. 3M is currently developing a plan for improving the bicycle and pedestrian networks on their campus. Since 3M is the major landowner near the Gold Line BRT station in Maplewood, implementation of this plan could potentially to have a major

impact on bicycling and walking conditions near the station. Furthermore, the city's *Living Streets Policy*[21], adopted in 2013, sets goals to "enhanced walking and biking conditions" and to "improve neighborhood aesthetics" in the function of a street. The *Living Streets Policy* is the standard for all new and reconstructed streets in Maplewood.

LANDFALL

The density and placement of homes and the narrow width of the streets create an environment where car traffic must move slowly, while improving safety. The majority of residential areas have sidewalks, though children often play and people often walk in the streets. However, the connection to the Greenway Avenue Station along Hudson Boulevard is not safe for pedestrians or bicyclists. There are no sidewalks along Hudson Boulevard, and no trees or businesses located near the street. The posted speed limit is 40 miles per hour and traffic moves quickly in the area.

OAKDALE

Oakdale's pedestrian network is incomplete. Pedestrian and bicycle connections are disconnected within the Gold Line BRT station areas in Oakdale. Future development provides opportunities to bring buildings to the lot lines, build pedestrian and bicycle connections, and provide a more pedestrian-friendly environment with multi-story buildings located next to sidewalks.

WOODBURY

Woodbury has experience implementing places, such as City Walk, that prioritize pedestrians and bicyclists, which encourages more people to occupy the spaces helping to create an environment that feels safe. This city also has an extensive off-street trail network that provides safe travel for bicyclists and pedestrians as it is often separated from traffic. Woodbury station areas can benefit from similar designs as City Walk and good connections to the off-street network.

ALL CITIES

There is room for improvement in the bicycle network within and between Gold Line BRT communities. Sidewalks will be necessary in many of the station areas and cities, which are mostly developed but lack sidewalks in many areas. Bicycle networks are similarly incomplete in the suburban communities. Saint Paul's current infrastructure and policy support for developing streets, which work for pedestrians, bicycles, and car traffic, is more thorough than the suburban communities. Gold Line BRT presents an opportunity for all of the corridor communities to improve the quantity and quality of their sidewalks and bicycle lanes and trails, including design elements such as lighting and landscaping.

Cities can move to address CPTED principles within local plans. Some cities who recognized personal safety or CPTED principles were mentioned the policy, but did not provide concrete strategies or implementation measures. Moving forward, communities should recognize the importance of the building environment, which supports personal safety through good design.

Suggested Recommendations

HIA Step: Recommendations

Similar to the way the elements were selected, suggested recommendations were included if positive health outcomes could result from land-use decisions. Suggested recommendations were determined through a review of available research and an analysis of current practices in each city. Since health results from complex interactions between people and their communities, cities have the opportunity to implement solutions they feel best serve their residents. The suggested recommendations listed below can be implemented in any combination to help build healthy, livable communities.

Connectivity

Walking and Bicycling to Destinations

- All Cities: Comprehensive plans should reference the Gold Line BRT project and set walking and bicycling visions for each station area. City council and planning commission members should walk and bicycle around the proposed station areas in today's environment. This practical experience would provide a better understanding of the challenges and barriers users might experience and would help to shape a vision for safe and accessible station areas. Recommendations for physical improvements or ordinance changes should follow from these visions.
- All Cities: Cities with station areas that may be redeveloped (e.g., Sun Ray Station in Saint Paul) should use grid layouts for new streets, with sidewalks on both sides of each street. Cities can also consider new connections in developed areas. Reducing distances between destinations is necessary to connect shopping, commuting, or other trips. A grid layout promotes the most direct connections and the shortest distance between places.
- All Cities: Monitor Walk and Bikes Scores as new infrastructure and new developments are built to understand how the changes are supporting or impairing connections to resources.
- All Cities: Follow transit-oriented development design principles for new development and consider how new development will interact with existing places and how someone could conveniently walk or bicycle.
- All Cities: When Metro Transit conducts its comprehensive study of transit in the corridor, each city should participate and encourage residents, especially transit riders, to participate.
- Maplewood/3M: When Gold Line BRT opens, 3M may consider becoming a Metro Transit employer and subsidize transit benefits for its employees.

Parking

- All Cities: Each city should evaluate the type and amount of parking needed for different land uses in each station area. Consider the visual impact of parking on station areas, as well as the distance it creates between destinations. Use renderings, models, and imagery to understand the impact new parking may have in an area. Seek opportunities to share existing parking with new uses, or to create district parking for multiple new uses.
- All Cities: Review and modify parking requirements to help reduce parking demand and promote more travel by alternative methods, such as walking and bicycling.

- All Cities: Explore shared parking or district-wide parking models for the corridor that support parking availability for all users versus the building of individual parking facilities serving only one development.
- Saint Paul: Consider reducing the minimum number of off-street parking spaces by 100% on all Traditional Neighborhood-designated pieces of land, not just those within a quarter mile of the station areas. This would follow the recent changes to the Saint Paul zoning code per the Central Corridor (METRO Green Line) Light Rail Transit station area plans.
- Maplewood: As 3M adds new buildings to its campus, consolidate parking into structures and place new buildings as close to the Gold Line BRT station as possible.
- Oakdale and Woodbury: Consider requiring parking lots to be placed at the rear of buildings in Gold Line BRT station areas.
- Woodbury: Further explore the idea of reducing parking requirements when bicycle or shared parking is available.
- Woodbury: When possible, apply mixed-use design standards to the Gold Line BRT station areas.

Housing

- All Cities: Gold Line BRT communities should address the importance of connecting affordable housing with the transit stations as part of their 2018 Comprehensive Plan Updates.
- All Cities: Communities should consider locating most or all affordable housing units near the Gold Line BRT station areas. Connecting affordable housing options with the station areas will provide better convenience and opportunities for using transit service. Locating housing near Gold Line BRT stations will also help reduce household transportation costs.
- All Cities: Gold Line BRT communities should place high-density affordable and market-rate housing near station areas.
- All Cities: Residential units should connect to the station areas with a complete network of sidewalks arranged in a grid-like pattern to provide the most direct trips possible.
- All Cities: Gold Line BRT communities should continue to coordinate and collaborate with the Metropolitan Council to meet the region's affordable housing goals, while implementing regional housing policies.
- All Cities: Consider enacting policies to replace any affordable housing lost to redevelopment.

Jobs

Unemployment and Underemployment

- All Cities: Strengthen language in comprehensive plan updates to specifically identify land use policies that support employment growth in Gold Line BRT station areas
- All Cities: Continue station area planning and economic development efforts, consistent with those completed in Saint Paul.
- All Cities: Pursue actions to better connect all communities to economic development initiatives, especially Landfall residents.

Economic Diversity

- All Cities: Acknowledge that transportation systems like the Gold Line BRT promote economic opportunities for workers and employers alike.
- All Cities: Support efforts to fight poverty, including connecting supportive resources and employment opportunities via transit.
- All Cities: Include in local plans the importance of locating jobs for convenient transit access, and enabling high-quality transit links to the corridor's major job centers.
- All Cities: Expand the promotion of local, county, and state programs that provide employment assistance.
- All Cities: Educate both elected leaders and the public on the importance of constructing the Gold Line BRT to coincide with job creation through economic development initiatives.

Employment Growth and Density

- Oakdale and Woodbury: Consider updating local plans to accommodate more activity around the transit stations, and build out roads and the walking environment in a transit-supportive manner.

Safety

Safety from Crime

- All Cities: Reference the impact the built environment has on public safety and public health in the comprehensive plans.
- All Cities: Incorporate CPTED principles into relevant plan sections such as transportation, parks and open space, and land use. This includes guidance for buildings located near the street, good lighting for pedestrians, and pedestrian and bicycle connections throughout the community.
- All Cities: Focus on building orientation as a critical part of maintaining safe environments.
- All Cities: Provide "form-based" guidance that requires sidewalks and design infrastructure that is safe and inviting. Form-based guidance supports predictable physical form rather than a traditional separation of uses. Strategies include signs providing directions, accommodations for individuals with mobility challenges, building orientations supporting good pedestrian environments, etc.

Safety While Traveling

- All Cities: Monitor performance of individuals traveling on foot or bicycle. Performance management strategies include collecting bicycle and pedestrian counts on an annual basis.
- All Cities and Counties: Use signs, infrastructure, and regulations to slow traffic and promote the safe travel of all transportation methods.
- All Cities and Counties: Those responsible for snow removal in public right-of-way should prioritize sidewalks, curb ramps, and trails for safe travel on foot.
- All Cities and Counties: Ensure existing and future development includes good lighting in public right-of-way and certain private areas (e.g., parking facilities, common areas, open space, alleys, and entrances).

Miscellaneous

- Ramsey and Washington Counties: Formalize coordination between departments and community stakeholders to develop and monitor performance measures related to safety and public health. Data over time could help identify priorities for improving the built environment and safety. Measures could relate to use of active transportation, implementation and use of safe routes to school, etc.
- All Cities and Counties: Local plans should incorporate health-related safety elements and align with comprehensive plans, zoning ordinances, and capital improvement plans.
    - If not already included, local comprehensive plans should contain the following elements:
        - Express the importance of a complete sidewalk network and indicate priorities for development and implementation of that network
        - Express the importance of a complete bicycle transportation network and indicate priorities for development and implementation of that network.
        - Include, refer to, and adopt a complete streets or similar policy.
        - Outline responsibilities for the maintenance of bicycle and pedestrian infrastructure.
        - Emphasize street safety for all users
        - Provide lighting guidance for pedestrians (also called pedestrian-scale lighting).
    - Zoning ordinances should address these comprehensive plan elements and indicate how they should be applied to various land uses.
    - If capital investment is necessary to comply with plans and ordinances, these improvements should be listed in local capital improvement plans.
    - Plans should be updated on a regular basis, and progress on safety improvements should be a local performance measure to which stakeholders are accountable.

Next Steps

Transitway projects, including Gold Line BRT, are crucial to improving our regional transportation system, and can increase a community's quality of life by providing convenient access to jobs, housing, recreation, and other daily needs. These projects are planned over time, and this HIA is one step in a transitway development process. Each level of analysis helps build a more comprehensive understanding of the conditions and needs of the communities along the corridor prior to the implementation of the transitway.

Station Area Planning

Federal environmental law requires projects using federal dollars, like Gold Line BRT, to complete an environmental assessment. The Gold Line BRT Draft Environmental Impact Statement is currently underway, and will disclose the impacts and benefits of the various alternatives under consideration. Concurrent with preparation of the Draft EIS, the Gold Line BRT project is also carrying out baseline station area assessments, which will include input from land use planning and real estate development perspectives. In order to better prepare each community for the Gold Line BRT, a more intensive station

area planning process will help cities facilitate infrastructure changes and development to encourage pedestrians, bicyclists, and drivers to comfortably use the Gold Line BRT. The station area planning process will be funded largely by a grant from the Federal Transit Administration (FTA) Pilot Program for Transit-Oriented Development (TOD) Planning. Gold Line BRT staff will work with corridor communities to incorporate HIA's suggested recommendations into station area planning scope of work so that each community can better customize the recommendations to their station areas. The HIA process showed a strong correlation between land use and health, and demonstrated that Gold Line BRT community members value healthy communities. As a result, health will be front and center in ongoing Gold Line BRT planning processes. Station planning activities will be ongoing throughout the transitway development process. See Figure 7 for the Gold Line BRT development process schedule.

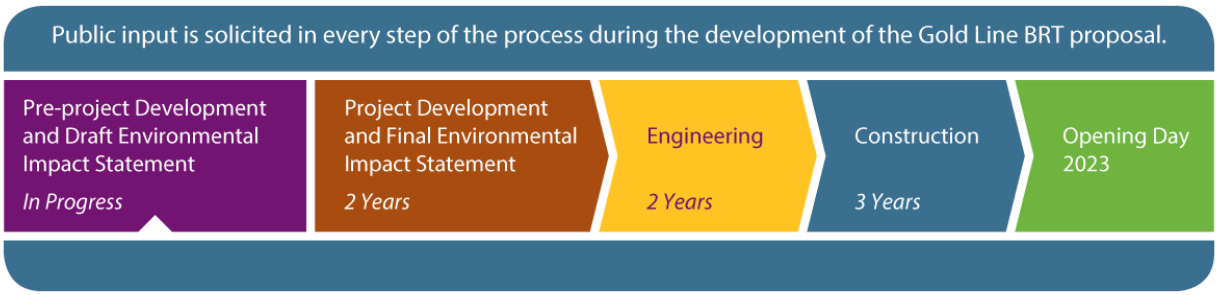

Figure 7: Gold Line BRT Development Schedule

Statewide Health Improvement Program

Saint Paul—Ramsey County Public Health and Washington County Public Health and Environment (PHE) have received funding through the Statewide Health Improvement Program (SHIP). SHIP is a statewide program, led by the Minnesota Department of Health, striving to help Minnesotans lead longer, healthier lives by decreasing tobacco use, poor nutrition, and physical inactivity. Current Ramsey and Washington County SHIP grants focus on working with cities to include health, specifically active living and healthy food access, within comprehensive plans. For example, in Washington County Gold Line BRT staff will collaborate with Washington County PHE for conversations with corridor communities to leverage findings and recommendations from the HIA, along with SHIP funds, to include health in comprehensive plans.

Conclusion

The complex interaction between health and our environment means healthcare alone cannot improve our health. In fact, health begins where we spend the most time—at home, at work, and in our communities. For this reason, how we design our communities matters, and health should be included early and explicitly in decision-making processes, including comprehensive plans. Comprehensive plans are one of the most influential tools a community can use to emphasize healthy and equitable decisions, and the results of this HIA can provide guidance to Gold Line BRT communities for future updates.

The comprehensive planning process is an opportunity for Gold Line BRT cities to reinforce their work towards creating healthy, livable communities. Cities play an essential role in the design of our environments and as a result yield great power in creating healthy communities. Gold Line BRT communities have previously implemented many health-supportive strategies, as indicated by research completed in this HIA. The analysis has also highlighted where opportunities exist for cities to bring health front and center in decision-making processes that will affect communities for years to come.

HIA participants, including representatives from Gold Line BRT communities, noted that the project helped increase their understanding of the relationship between land use decisions and health. Our analysis combined with stakeholder input has helped identify potential opportunities for cities to address in their comprehensive plans. Conversations surrounding community health are ongoing, and comprehensive plans are one of many opportunities to consider health in policy making. Accordingly, the results of this HIA can guide community-wide discussions surrounding health improvement well beyond the Gold Line BRT. The breadth of suggested recommendations in this study allows a city to choose the best strategies to meet its own community-based vision for health. Each Gold Line BRT city can work collaboratively with community members to understand health concerns and to develop and achieve their vision for an equitable, healthy community.

Appendix A: Study Methodology

Introduction

Development of the Gold Line BRT HIA started with in-person and online engagement of residents, established public-health-focused groups, and city staff for corridor communities. Corridor stakeholders identified from a list the topics to study in the HIA through a worksheet, a series of in-person meetings, and a half-day workshop. They selected housing, connectivity, jobs, and safety as four elements of the built environment that determine public and individual health in their communities.

Once the four elements were selected, the HIA team established a vision for each element. The research began with the literature review, then progressed to the assessment, and concluded with development of one-page summaries.

Research Methods

Vision Statements

Because the four elements represent such broad topics, a vision statement for each was set by the HIA project team and reviewed and edited by stakeholders before finalized. The vision statements served to frame up the research.

- Housing: Increase housing options for all ages, incomes, and lifestyles.
- Connectivity: Provide convenient and reliable ways to walk or bicycle to basic needs and services.
- Jobs: Increase the number and variety of jobs near station locations.
- Safety: Create safe places for walking and bicycling while reducing crime.

Literature Review

The literature review demonstrates the link between each of the four elements and public health outcomes using creditable resources such as public health, planning, and transportation journal articles, research, and best practices. The literature review functions as a check on the four elements and confirms that connectivity, housing, jobs, and safety each have a strong and proven relationship to public health.

The following reports formed a foundation for the Gold Line BRT HIA Literature Review:

- **Design for Health (2006-2012)**—Design for Health (DFH) was a collaborative project between the University of Minnesota and Blue Cross and Blue Shield of Minnesota to bridge the gap between the emerging research database on community design, healthy living, and everyday realities of local government planning.

- **Healthy Corridor for All Health Impact Assessment (2011)**—Health Corridor for All was a HIA for transit-oriented development associated with the Central Corridor (METRO Green Line) Light Rail project in Saint Paul, Minnesota. This HIA was chosen as a precedent example for its relevant health research as it applies to the Gold Line BRT.
- **Bottineau Transitway Health Impact Assessment (2013)**—This HIA was completed for the Bottineau Transitway (also known as the METRO Blue Line Extension), a proposed light rail transitway in northwest Twin Cities. This HIA was chosen for its relevant health research as it applies to the Gold Line BRT.

The results of the Literature Review are available in Appendix B.

Assessments

Assessments were completed for each of the four elements.

Connectivity

Walking and Bicycling to Destinations

Bicycling and walking conditions in each station area were evaluated using Walk Score and Bike Score, a source measuring amenities within walking or bicycling distance of a given location. Population density and road measurements such as block length, intersection density, and presence of bicycle infrastructure also contribute to the score.

WALK SCORE

For each address, Walk Score studies hundreds of walking routes to nearby resources such as grocery stores, schools, parks, restaurants, and retail stores. Points are awarded on a 100-point scale based on the distance to these destinations. Amenities within a five-minute walk (.25 miles) are given maximum points, with fewer points awarded to greater distances, and no points awarded for destinations beyond a 30-minute walk. Population density and road metrics such as block length and intersection density also contribute to the score. Data sources include Google, Education.com, Open Street Map, the U.S. Census Bureau, Localeze, and places added by the Walk Score user community.[22] Walk Score data can also be tracked over time to measure historical trends.

BIKE SCORE

Bike Score is created based on the following four criteria: the presence of bicycle infrastructure referred to as a "bike lane score", the presence of hills, the number of destinations and resources (grocery stores, schools, parks, restaurants, and retail) similar to Walk Score, and the bicycle mode share, which is the percentage of trips in the region that are taken by bicycle.[23]

BIKE LANE SCORE

The Bike Lane Score is based on data provided by city governments. Bike lane infrastructure currently includes all on and off street bike lanes and paths, but does not include infrastructure such as bike parking, bike sharing, etc. To account for the differences in bicycle infrastructure types across cities, bikeways were categorized generally as on-street or off-street lanes. Off-street lanes are considered twice as valuable as on-street lanes.

For a given location, Bike Score adds up the length of all nearby bike lanes, and assigns points based on nearby existing lanes. No value is given to segments further than 1,000 meters from the origin.

HILL SCORE

To calculate the "hilliness" of an area, Bike Score looks at the steepest grade within a 200 meter circle around a given location. Hills with the steepest grade (10% or higher) are given zero points, with greater points awarded to flatter areas. The data source is the National Elevation Data set from the United States Geological Survey.

CONNECTION TO DESTINATIONS

To measure connectivity to destinations, Bike Score uses an adjusted version of Walk Score, which measures the network distances to a diverse set of amenities and calculates connectivity measurements such as average block length and the number of intersections in an area.

BICYCLE MODE SHARE

This factor accounts for the social aspects of bicycling and “safety in numbers” research. When more people bicycle, drivers are more likely to have had experience bicycling and are more aware of other users on the road. The data comes from the U.S. Census Bureau.

Parking

Because the placement and quantity of parking is often related to the quality of bicycle and pedestrian connections, connectivity is also evaluated by consideration of how each community deals with parking in its station areas, as described in its zoning code and comprehensive plan.

For this HIA, parking evaluation is based on several assumptions (Table 23) about how parking affects the physical form of a station area, which in turn affects whether walking or bicycling to destinations is an attractive option.

Table 23: Parking Assumptions and Assessment Criteria

Assumptions Regarding Parking in Station Areas	Assessment Criteria
In station areas establishing and/or maintaining a quality walking environment is prioritized over convenience for drivers.	Does the zoning code allow for reduced parking within a transit station area?
Many retail developments such as shopping centers, strip malls, and big-box retail and grocery stores have excess parking that is never used. Often, this parking is built according to city ordinances that require a minimum number of stalls per square foot of development.	Does the zoning code specify parking minimums? Does the zoning code specify parking maximums? Does the zoning code allow for the potential of no new parking at the developer's discretion?
It is possible to share parking between compatible uses.	Does the zoning code allow for shared parking between compatible uses? Does the city own municipal parking lots used for shared parking?
It is possible to reduce the need for parking by welcoming other modes of transportation (e.g., transit, walking, bicycling, and car sharing).	Does the zoning code allow for reduced parking with provision of bicycle parking or on-site car sharing? Does the city practice Travel Demand Management and use any tools to reduce single-occupancy-vehicle travel?*
City streets can be valuable sources of parking spaces.	Does the city allow on-street parking on local streets in its station areas?
Charging for parking can help control demand, shift trips to biking, walking, and transit, and garner a return on a physical investment.	Does the city charge for parking in any locations within a Gold Line BRT station area?
Parking design and the placement in relation to the street and buildings is critical to maintaining a walkable environment.	Does the comprehensive plan discuss design and siting of parking lots with regard to visual impacts or pedestrian environment?
Outside of downtown Minneapolis and downtown Saint Paul, few new developments in the Twin Cities region are built with no new parking.	Does the comprehensive plan discuss design and siting of parking lots with regard to visual impacts or pedestrian environment?

* Travel Demand Management (TDM) is a set of tools to reduce single-occupancy-vehicle travel and facilitate use of transportation choices for work and non-work trips. By promoting modes of travel such as ridesharing, vanpooling, transit, bicycling, and walking, TDM improves the efficiency and capacity of the existing transportation

system. TDM also includes strategies like staggered work schedules and telecommuting, which can shift and reduce overall demand on the transportation system.

Housing

A brief summary of the affordable housing conditions in each Gold Line BRT community is provided, as documented in their comprehensive plans. The existing housing conditions are then evaluated by the following criteria: progress toward regional affordable housing goals as defined by the Metropolitan Council; housing cost burden as it relates to household income and transportation costs; and residential densities measured in households per acre.

Evaluation criteria were determined by established local and regional policies and by the data available.

Affordable Housing in the Region

The Metropolitan Council collects data on each city's past performance with regard to meeting the regional need for affordable housing. The criteria used for this HIA are consistent with those from the Metropolitan Council. The evaluation provided in Housing section is an adapted version of the Metropolitan Council assessment to include only Gold Line BRT communities.

METROPOLITAN COUNCIL AFFORDABLE HOUSING ALLOCATION PROCESS

According to the Metropolitan Land Planning Act, cities' comprehensive plans must include:

> "…a housing implementation program, including official controls to implement the housing element of the land use plan, which will provide sufficient existing and new housing to meet the local unit's share of the metropolitan area need for low and moderate income housing.[24]"

The Metropolitan Council calculates each local government's share of the region's need for affordable housing every ten years. These calculations are provided local jurisdictions for use in preparing their comprehensive plans. The number of new affordable units prescribed for each city is calculated by how much the city is projected to grow, and then is adjusted in two ways:

- **Ratio of low-wage jobs to low-wage workers:** The ratio of low-wage jobs in the community to low-wage workers who live in a community indicates whether a community imports low-wage workers to fill its low-wage jobs and could therefore use more new affordable housing for those workers.
- **Existing affordable housing:** Placing new affordable housing in communities where existing affordable housing is scarce expands choice for low-income households.

The outcome of this process is a required number of affordable units that each city is expected to fulfill within the ten-year period; these are shown in Table 24 for the Gold Line BRT cities.

Table 24: Affordable Housing Unit Allocations for 2021-2030

City	Net Growth between 2020 and 2030	Units of Affordable Housing Allocated
Saint Paul	6,700 households	1,973 units
Maplewood	1,900 households	510 units
Landfall	0 households	0 units
Oakdale	500 households	152 units
Woodbury	2,700 households	1,043 units

METROPOLITAN COUNCIL ASSESSMENT CRITERIA

To ensure local accountability, the Metropolitan Council maintains several key measures of each local jurisdiction (cities and townships):

- How many new housing units, both owner-occupied and rental, meet the criteria for affordability?
- How many existing housing units are affordable, including both owner-occupied and rental, and subsidized and unsubsidized units?
- What is each local jurisdiction's Housing Performance Score?

The Housing Performance Score is calculated on an annual basis for each of the region's cities and townships. It assesses local efforts to develop and maintain affordable housing and support low- and moderate-income households through a variety of programs and services. The Metropolitan Council uses the scores to prioritize funding to communities that are maintaining or expanding their supply of affordable housing and using fiscal, planning, and regulatory tools to promote affordable and mixed-income housing. At the same time, the Metropolitan Council grants funding preference under the Local Housing Incentives Account to cities with lower scores.

Although the definitions of affordability have changed, the Metropolitan Council has been reporting the count of new affordable housing units added in the region every year since 1996. For a number of years, the Metropolitan Council has used a single threshold of 60% of area median income in its Housing Performance Scores, limiting the housing efforts that count toward the scores. In keeping with the *2040 Housing Policy Plan*'s approach, the scores will now include a wider definition of affordable housing and credit cities for all affordable housing production or preservation at or below 80% of area median income, and homeownership activities up to 115% of area median income. Affordable housing at 30% of AMI and below will receive the highest scores.

The Metropolitan Council tracks all new housing constructed in the region and determines its affordability at 30%, 50%, and 80% of area median income. The Metropolitan Council also maintains an annual "Inventory of Affordable Housing" that documents the existing affordable housing stock, and calculates and reports on each local jurisdiction's annual Housing Performance Score. The Housing Performance Score is calculated out of 100 available points from four main areas:

- Recent or new construction projects completed in the last 10 years (0-35 points)
- Recent preservation projects in last 10 years or substantial rehabilitation in last 3 years (15-50 points)
- Housing programs and policies in place and in use in the last 5 years (0-25 points) and
- Characteristics of the existing housing stock (0-25 points)

A score of 0 indicates a lack of any housing activity and 100 reflects outstanding performance in meeting affordable housing goals, providing housing-related services, and approving and contributing to housing development, redevelopment, rehabilitation, and preservation.

The HIA reports the number of new and existing affordable units in each Gold Line BRT community, as well as each city's annual Housing Performance Score over the past six years (2010-2015), and suggests continual monitoring of this measure in the coming years.

HOUSING COST BURDEN

The Center for Neighborhood Technology's Housing + Transportation Affordability Index (H+T Index) presents housing and transportation data as maps, charts, and statistics for 917 metropolitan and slightly smaller metropolitan areas—covering 94% of the US population. Costs are available from the regional down to the census-block-group level.

According to the Center for Neighborhood Technology (CNT), planners, lenders, and most consumers consider housing affordable if the cost of housing is 30% or less of household income. Research done by CNT across metro areas of varying sizes has found that spending 15% of income on transportation is an attainable goal for transportation affordability. Therefore, locations where combined housing and transportation costs constitute less than 45% of median household income are considered affordable to the typical household.

The H+T Index "typical household" is one that earns the median regional income, is the average regional household size, and has the regional average number of commuters per household. By fixing income, household size, and commuters, the model controls for the impact of these variables on transportation costs. Differences in transportation costs are therefore a result of neighborhood characteristics and variation in the built environment.

The HIA assessment uses the H+T Index to gather the housing and transportation costs as a percentage of area median income for the census blocks, the smallest geographic unit used by the U.S. Census Bureau for data collected from all houses, immediately adjacent to each station location, as well as each local government as a whole.

RESIDENTIAL DENSITY

Because land within the station areas is scarce and living near a transitway station presents a benefit to existing and future residents in the form of lower transportation costs, residential density is an important consideration in the development of affordable housing near transit. The HIA included existing residential densities in transit station areas according to each city's comprehensive plan.

Jobs

Diversity and number of jobs in the corridor station areas is measured using several criteria: projected employment growth using Metropolitan Council forecast employment by Transportation Analysis Zone (TAZ), employment density in station areas measured in jobs per acre; transit access to jobs measured by the types of transit service available at each Gold Line BRT station and their connectivity to regional job centers; economic development initiatives that direct local and regional economic development resources toward station areas; and socially-supportive resources such as food, and shelter.

Projected Employment Growth

Overall, job growth has a positive impact on improving the employment status of people that are unemployed or underemployed. In this category, the projected employment growth at each transit station area, based on 2040 forecast data provided by the Metropolitan Council was evaluated.

Employment Density

Accessibility to jobs via transit is an important measure of the benefit of a transit service. Density provides a measure of the form in which jobs are clustered in the station areas. This provides guidance on how many potential jobs could be added if a given area is redeveloped. Employment density was used as a measurement for this assessment.

Transit Access to Jobs

Equitable access to jobs can be measured by how easily one can commute to a work site by transit. For this assessment, the types of transit service available at each transit station and their connectivity to job centers were evaluated using the following criteria:

- Does the transit station currently have a direct transit connection to a central business district (CBD), either Minneapolis or Saint Paul?
- Does the transit station currently have a direct connection to an existing transitway?
- Is the station on Metro Transit's "Hi-Frequency Network" offering transit service every 15 minutes or better on weekdays and Saturdays?
- Is there service offered during peak periods?
- What types of local service are available? Urban local? Suburban local?
- Are there multiple midday trips available outside of the morning and afternoon rush hours?

- Are there multiple evening trips available outside of the afternoon rush hour?

Economic Development Initiatives

The Gold Line BRT community's land use, station area, and economic development plans were reviewed to determine their economic development initiatives. An important first step in directing local and regional economic development resources toward transitway station areas is the completion of station area plans. Station area plans typically present a vision for a station area, identify commercial and residential real estate development opportunities and timelines, and point to infrastructure upgrades that set in motion development and redevelopment and improve access and circulation within the station area. The City of Saint Paul completed detailed station area planning with intensive feedback from community members in 2015. Maplewood, Landfall, and Oakdale completed high-level preliminary station area plans for their stations.

Supportive Resources

This assessment included an inventory of centers along the Gold Line BRT that provide food, shelter, and other types of support. This is not intended to be a study of these resources. Rather, it is an acknowledgement that access to these resources by transit is important, as they present potential paths to employment, improved health outcomes for people in need, or both.

Safety

Safety in the Gold Line BRT station areas is considered with regard to bicycling and walking, as well as personal safety from crime. Safety while traveling by bicycle or walking is evaluated by considering the sidewalk and bicycle networks in the stations areas, the maintenance plans for such facilities, and street speed limits and design speeds. Personal safety is evaluated by reviewing policies presented in each city's comprehensive plan that support Crime Prevention Through Environmental Design (CPTED) principles.

Safety from Crime

The assessment reviewed policies presented in each city's comprehensive plan that support crime prevention.

Crime Prevention Through Environmental Design

In her influential 1961 treatise *The Death and Life of Great American Cities,* Jane Jacobs introduced the concept of "eyes on the street", also referred to as "natural surveillance" (see box below).[25]

> ***"A city street equipped to handle strangers, and to make a safety asset, in itself, out of the presence of strangers, as the streets of successful city neighborhoods always do, must have three main qualities:***
>
> ***First, there must be a clear demarcation between what is public space and what is private space. Public and private spaces cannot ooze into each other as they do typically in suburban settings or in projects.***
>
> ***Second, there must be eyes upon the street, eyes belonging to those we might call the natural proprietors of the street. The buildings on a street equipped to handle strangers, and to insure the safety of both residents and strangers, must be oriented to the street. They cannot turn their backs or blank sides on it and leave it blind.***
>
> ***And third, the sidewalk must have users on it fairly continuously, both to add to the number of effective eyes on the street and to induce the people in buildings along the street to watch the sidewalks in sufficient numbers. Nobody enjoys sitting on a stoop or looking out a window at an empty street. Almost nobody does such a thing. Large numbers of people entertain themselves, off and on, by watching street activity."***
>
> **- Jane Jacobs, *The Death and Life of Great American Cities***

Beginning with Jacobs' observations, the relationship between the built environment and criminal activity or perceptions of unsafe spaces has been well documented. CPTED has emerged as an approach to deterring criminal behavior. CPTED is based on the idea that the proper design and effective use of the built environment can lead to a reduction in the incidence and fear of crime, and an improvement in quality of life. Three basic principles govern CPTED:

- **Natural Surveillance:** Natural surveillance is achieved through design and maintenance that allows people engaged in their normal activity to easily observe the space around them, and eliminates hiding places for people engaged in criminal activity. Natural surveillance is generally achieved by the use of appropriate lighting, low or see-through fencing or landscaping, the removal of areas that offer concealment, and the placement of windows, doors, and walkways to provide the opportunity for easy observation of surrounding areas.
- **Territoriality:** Territoriality is clear designation between public, private, and semi-private areas and is intended to make it easier for people to understand and participate in an area's intended use. Territoriality communicates a sense of active "ownership" of an area that can discourage the perception that illegal acts may be committed in the area without notice or consequences. The use of see-through screening, low fencing, gates, signage, different pavement textures, or other landscaping elements that visually show the transition between areas intended for different uses are examples of the principle of territoriality.
- **Access Control:** Access control is a concept directed primarily at decreasing criminal accessibility, especially into areas where a person with criminal intent would not easily be seen by others. Examples of access control would include a highly visible gate or entry way through which all users of a property must enter, or the appropriate use of signage, door and window

locks, or fencing to discourage unwanted access into private space or into dark or unmonitored areas.

Municipal Tools for Implementing CPTED Principles

There are several policy and regulatory tools a city can use to implement CPTED principles in rural, suburban, or urban contexts:

- **Comprehensive Plan:** The comprehensive plan guides development in a given community, and governs the arrangement of a city's land, streets, and buildings and the infrastructure that supports them. Inclusion of CPTED in the comprehensive plan allows for implementation of its principles in the zoning code.
- **Zoning Codes:** Zoning codes govern how public and private spaces interact. This includes the use and form of buildings, such as setbacks, facades, and windows, as well as landscaping, and driveway and parking placement. The design orientation of buildings with windows near to and facing the street can increase natural surveillance by both residential and commercial neighbors.
- **Street Planning and Design Policy:** In order for a street to attract the walkers and bicyclists who bring activity and eyes to the area, it must function well for those users. In 2010, the State of Minnesota passed "Complete Streets" legislation that requires the Minnesota Department of Transportation (MnDOT) to implement a statewide Complete Streets policy. The policy affects all trunk highways, as well as county state-aid highways and municipal state-aid streets when a variance is requested. The legislation encourages, but does not require local units of government to pass complete streets policies. However, municipalities may find that a complete streets policy is an effective tool for implementing CPTED principles. For example, it forces planners, designers, and elected officials to consider streets' form and function by integrating amenities (e.g., lighting, signage, landscaping, and pavement markers) that create a safer environment from a user's personal safety perspective.

Safety While Traveling

The assessment reviewed policies presented in each city's comprehensive plan that supports personal safety while traveling on foot or bicycle.

Municipal Tools for Implementing CPTED Principles

A number of conditions contribute to actual and perceived safety while traveling by foot or by bicycle:

- **Sidewalk Networks:** Providing sidewalks on both sides of every street allows for pedestrians to access destinations without walking in vehicular traffic and keeps pedestrian movements more predictable to other users of the street. Pedestrian-scale lighting along the sidewalk network helps to keep the sidewalks useful and attractive even after dark. Landscaped boulevards between the sidewalk and street offer a buffer between vehicular traffic and pedestrians, and provide a place for street trees to grow and shade the sidewalk. Marked crosswalks are an important component to the sidewalk network. Marked pedestrian crossings serve as a visual cue to drivers that pedestrians are present and have a location for crossing.

- **Bicycle Networks**: Well-marked bicycle facilities, whether they are off-street trails, cycle tracks, on-street lanes, or shared lanes with vehicular traffic, allow for bicyclists to move in a predictable manner, direct vehicular traffic to maintain a reasonable distance from bicyclists, signal the potential of bicyclists on the road, and encourage bicyclists not to use sidewalks.
- **Maintenance of Sidewalks and Bicycle Facilities:** In addition to constructing sufficient pedestrian and bicycle facilities, these facilities must be adequately maintained, both day-to-day and long term. Snow removal is especially important for safety, as it helps to prevent ice from developing on sidewalks and trails. Poorly maintained infrastructure can also be a physical barrier to using active modes of transportation, particularly for vulnerable populations like children and older adults, and people with mobility challenges. In that respect, pedestrian and bicycle facilities should be regularly maintained and preserved to ensure they do not deteriorate over time.
- **Speed Limits and Design Speeds:** Vehicle speed is an important safety issue for bicycles and pedestrians. The speed of the car in a pedestrian or bicycle crash greatly affects the severity of injury for those involved. The likelihood of fatalities in crashes involving a vehicle and a pedestrian or person on a bicycle decreases substantially as vehicle speeds slow. Beyond speed limits, roadway design elements can make drivers more aware of their surroundings, drive more slowly and cautiously and in turn reduce the likelihood of fatal crashes.
- **Lighting:** Good lighting for pedestrians helps to create a safer, more inviting environment that allows for better use of pedestrian infrastructure after dark. As noted, proper lighting and clear sightlines are elements of “natural surveillance,” so people engaged in their normal activities can easily observe the space around them and spaces where criminal activity can occur are reduced.

Appendix B: Literature Review

Listed below are the key findings of studies, reports, policy papers, and scientific publications. Items with a "✓" highlight research that is directly or indirectly linked to social equity.

Gold Line BRT - HIA Literature Review				
Health Element	**Social Equity**	**Key Words**	**Summary**	**Reference Number**
Connectivity	✓	Washington County, health assessment, healthy food	The Washington County Community Health Improvement Plan completed in 2014, found that one in five adults living at or below 200% of the federal poverty level reported meeting the recommended daily intake of fruits and vegetables. In order to address this concern, Washington County organized the Chronic Disease Prevention Committee, a committee of more than 20 partners from across the county focused on improving access to healthy food, among a variety of other health-related topics.	26
Connectivity	✓	Ramsey County, health assessment, healthy food, physical activity	The Ramsey County Community Health Assessment was completed in 2013. Ramsey County has more residents, particularly children and people of color, living in poverty than any other metro county. Low-income families are more likely to face barriers in accessing health foods, participating in physical activity, and choosing where to live.	27
Connectivity		Washington County, health assessment, access, primary care, zero-vehicle households	The Washington County Community Health Improvement Plan also found that transportation could be substantial barrier to maintaining health, especially regarding the ability to access primary care services. About 3.4% of all Washington County households had no vehicle access.	28
Connectivity		Washington County, residential survey, access, transit	Survey responses from Washington County residents in the 2013 Residential Survey listed "Ease of travel by public transit in Washington County" as the most significant potential problem in the county.	29
Connectivity	✓	Access, transportation, housing, employment,	A Federal Highway Administration (FHWA) study completed in 2013 found that fewer transportation options can lead to increase transportation costs and inequitable access to	30

		healthy food, access	employment, housing, and healthy foods.	
Connectivity	✓	Healthy food, disease prevention, childhood development, low-income, people of color, access	Good nutrition is vital to health, disease prevention, and childhood development. When people have access to healthy food options they are better able to include healthy food in their diets. Previous studies have found that low-income and people of color often live in environments that, compared to middle and upper-middle class areas, are less likely to have access to supermarkets and other venues selling a variety of higher quality food items. Also, low-income and minority neighborhoods have more fast food restaurants and liquor stores.	31
Connectivity	✓	Census, people of color, foreign-born, access	Data from the 2009 American Community Survey (ACS) indicated that the rate of public transportation usage among the foreign-born population was 10.8%, more than twice that of the native-born population, at 4.1%.	32
Connectivity		Pedestrian, walkability, commute, physical activity	Connectivity to safe and modern pedestrian facilities that enhance the walkability of neighborhoods surrounding transit facilities is an important consideration for transit projects. Walking to transit facilities and destinations can improve health. A 2005 article in the *American Journal of Preventative Medicine* reported that 29% of people using transit to get to work met their daily requirements for physical activity from walking to work.	33
Connectivity	✓	Access, education	Access to educational facilities is an important factor to consider when studying transit connectivity. When people have access to education they have better chances of securing jobs that pay well and do not expose them to dangerous or unhealthy conditions. They also gain knowledge and skills that help them access health information and resources.	34
Connectivity		Access, health care, GIS	The University of Minnesota's Design for Health Study identified that access to health care, both preventative medicine and acute care, is an important factor to the health of a community. The study recommended that health care facility planning can benefit from geographic information system (GIS) optimization modeling, which determines the best location, capacity,	35, 36

			and cost of new health care facilities. This is a common decision support tool for forecasting new hospital locations and determining underserved areas. The report cited examples of GIS modeling used for health care systems in Pennsylvania and North Carolina	
Connectivity		Zoning, land use, transportation, access, comprehensive plan, TOD, multimodal	The importance of zoning for transit is in the coordination between transportation and land use. Accessibility and connectivity can be addressed in comprehensive planning by integrating it into elements, such as transportation, public services, mobility, circulation, and design. It might also be addressed in supplemental plans, such as transit-oriented development (TOD) and multimodal master plans.	37
Connectivity		Land use, zoning, urban sprawl, physical activity, obesity, morbidity	Previous studies have shown the detrimental health effects of urban sprawl and poor land use planning. Zoning's separation of uses created vast suburban communities where routine daily trips to stores and schools must be done in automobiles. A 2003 study, *Relationship between Urban Sprawl and Physical Activity, Obesity, and Morbidity,* found that people living in counties marked by sprawling development are likely to walk less and weigh more than people who live in less sprawling counties.	38
Connectivity		Walkability, community design, basic goods and services	A 2006 report from the Atlanta Regional Health Forum and the Atlanta Regional Commission recommended that good neighborhood design should include schools that are integrated with residences offering the opportunity to walk or bicycle to school and residences that are integrated with shopping options such as grocery stores, pharmacies, and other retail stores.	39
Connectivity	✓	Healthy food, zoning, financial incentive, low-income	A 2008 study in New York City found that many low- and moderate-income neighborhoods across the city were underserved by grocery stores offering a full line of healthy foods. In response, the City of New York developed the Food Retail Expansion to Support Health (FRESH) program to facilitate the development of stores selling a full range of food products with an emphasis on fresh fruits and vegetables, meats, and other perishable goods. This program	40

			provides zoning and financial incentives for neighborhood grocery stores to locate in some of the most underserved neighborhoods in the City with primarily pedestrian-oriented, local shopping districts.	
Connectivity		Walkability, basic goods and services	While providing connectivity to basic needs and services is an important feature of transit projects, the reality is that a quarter mile is the distance that most people are willing to walk to transit regardless of the pedestrian infrastructure available.	41
Connectivity		Access, basic goods and services, health care, healthy food	In a report sponsored by the Minnesota Department of Transportation, Hennepin County, and the Metropolitan Council, researchers studied a variety of methods to measure accessibility, including "place rank", "cumulative opportunity", and "gravity based". These methods could be used to measure accessibility to basic needs, such as healthy foods, health care, and education.	42
Connectivity	✓	Land use, social, environmental impact, sprawl, social inclusion, mobility, access	In a report sponsored by the Victoria Transport Policy Institute, researchers study ways that transportation decisions affect land use patterns, and the resulting economic, social, and environmental impacts. Finding that sprawl tends to reduce social inclusion and increase the costs of providing basic mobility (Sanches and Brenman, 2007). Described more positively, by improving accessibility and affordable travel options (walking, cycling, ridesharing and public transit) Smart Growth tends to improve accessibility for disadvantaged people, improving their productivity and opportunities.	43
Connectivity		Sprawl, community design, physical activity, walkability	The American Academy of Pediatrics (2009) argues that conventional, sprawled community design is unhealthy, particularly for children, because it discourages physical activity. Research by Lawton (2001), Khattak and Rodriguez (2003), and Gehling indicate that residents of more urban, walkable communities are more likely to achieve recommended levels of physical activity than residents of more automobile-oriented, sprawled communities.	44
Connectivity		Walkability, mixed-use, social capital,	Studies also found that people living in walkable, mixed-use neighborhoods have higher levels of social capital compared with those living in car-	45

		public participation, engagement, community cohesion	oriented suburbs. Walkable neighborhood residents were more likely to know their neighbors, participate politically, trust others and be socially engaged, suggesting that polices and projects that support walking and public transit use, and increase land use mix, tend to increase community cohesion	
Connectivity		Commute, stress, psychosomatic, sickness	In an Occupational and Environmental Health article, commuting was found for many workers to be a necessity, which is imposed by external factors, such as the housing market and job opportunities. Commuting is shown to interfere with patterns of everyday life by restricting free-time and reducing sleeping time. Commuters also reported higher psychological stress scores, more health complaints, essentially of psychosomatic nature, and greater absenteeism from work due to sickness.	46
Connectivity		Commute, physical activity, body mass index (BMI), blood pressure	Commuting distance [is] adversely associated with physical activity, cardiorespiratory fitness, adiposity, and indicators of metabolic risk. [Research found] commuting distance was negatively associated with physical activity and cardiorespiratory fitness and positively associated with body mass index, waist circumference, systolic and diastolic blood pressure, and continuous metabolic score in fully adjusted linear regression models.	47
Connectivity		Commute, walking, bicycling, cardiovascular risk, women	Active commuting that incorporates walking and cycling was associated with an overall 11% reduction in cardiovascular risk, which was more robust among women.	48
Connectivity		Parking, access, walkability, Smart Growth, energy consumption, emissions, pollution, conservation	A 2015 study found that parking management (flexible minimum parking requirements, shared parking, priced parking and regulations to encourage efficient use of parking facilities) affects [energy consumption and emissions through] relative price and convenience of driving, and affects land use density, accessibility and walkability. Smart Growth tends to reduce per capita energy consumption and pollution emissions, by reducing per capita vehicle travel and supporting other energy conservation strategies such as shared building walls and district heating.	49

Connectivity	✓	Public transportation, cognitive disabilities, access, social, independence	Public transportation systems are among the most ubiquitous and complex large-scale systems found in modern society. For those unable to drive such as people with cognitive disabilities, these systems are essential gateways for participation in community activities, socialization, and independence.	50
Connectivity	✓	Equity, opportunity, access, education, employment	There is an ongoing debate about how to measure vertical equity. There is general agreement that everybody deserves "equity of opportunity," meaning that disadvantaged people have adequate access to education and employment opportunities. Transportation affects equity of opportunity. Without adequate transport it is difficult to access education and employment. It therefore meets the most "conservative" test of equity.	51
Connectivity	✓	Community design, disabled, physical activity, walkability, integration, mobility, elderly	The design of the built environment has a substantial impact on the ability of persons with disabilities to be physically active, to use transportation systems, and to be socially integrated into their community. Communities that have user-friendly transportation systems and are compact and walkable are more accessible for persons with disabilities, allowing them to participate more fully in the community by working, shopping, and living within the integrated setting. Persons who use wheelchairs and other mobility devices generally benefit whenever a community is made more walkable, as long as appropriate accommodations (such as curb cuts) are included in such community improvements. Elderly persons without disabilities may receive similar benefits in improved quality of life from community designs that aid persons with disabilities.	52
Housing	✓	Expense, affordable, low-income, stress, instability	Transportation and housing costs are the two largest expenses for American families. A lack of affordable housing within communities may compromise the health of low-income residents as they spend more on housing costs and less on health needs. It can also put residents at greater risk of exposure to problems associated with poor-quality housing (mold, pests, lead, and other hazardous substances), and cause stress and other adverse health outcomes because of potential housing instability.	53

Housing	✓	Cost, spending, income, shared housing, substandard, basic needs and services, social networks	High housing costs relative to the income of an individual or household result in one or more outcomes with adverse health consequences: spending a high proportion of income on housing, sharing housing with other individuals or families, accepting lower-cost substandard housing, moving to where housing costs are lower, or becoming homeless. Spending a high proportion of income on rent or a mortgage means fewer resources for food, heating, transportation, health care, and child care. Sharing housing can mean crowded conditions, with risks for infectious disease, noise, and fires. Lower-cost housing is often substandard, with exposure to waste and sewage, physical hazards, mold spores, poorly maintained paint, cockroach antigens, old carpeting, inadequate heating and ventilation, exposed heating sources and wiring, and broken windows. Moving away can result in job loss, difficult school transitions, and the loss of health-protective social networks.	54
Housing	✓	TOD), displacement, low-income, communities of color, cost of living	As transit-oriented development (TOD) has been constructed in many cities, including Portland and Washington, DC, it has often been accompanied by displacement of low-income persons and communities of color. Higher-income populations are finding compact living near transit desirable, driving up the property value of land near transit. This has resulted in increased rents and/or property taxes for existing residents, who may ultimately be displaced because of the higher cost of living. Additionally, research has shown that transit investments can result in more expensive housing, more wealthy residents, and higher vehicle ownership, which, in some neighborhoods with new transit projects, can price out core transit users such as low-income households and renters.	55, 56
Housing		Home ownership, cardiovascular disease	Home ownership has been independently linked to improved health among residents. Home ownership may generate a degree of security and control. Additionally, for residents, a higher rate of homeownership in a neighborhood has been associated with fewer years of life lost due to cardiovascular disease. However, home ownership might not always promote health; for	57, 58, 59

			instance, people living on the margins of home ownership and those at risk for mortgage arrears may suffer increased insecurity and poorer mental health.	
Housing		Home ownership, social cohesion, civic participation, neighborhood investment	Homeownership positively influences the social cohesion and civic participation of a neighborhood, which, in turn, can affect health. Homeowners are more likely to feel invested in their community, which could also be linked to improved housing and neighborhood quality	60
Housing		Displacement, mental stress, social network, affordability, psychological well-being	Unstable housing conditions can lead to involuntary displacement, which can cause or contribute to mental stress, loss of supportive social networks, costly school and job relocations. Displacement also increases risk of substandard housing and overcrowding. Evidence suggests that related issues associated with housing affordability, such as keeping up with utility bills, mortgage payments, or home repairs may be linked to lower levels of psychological well-being and a greater likelihood of seeing a doctor.	61, 62, 63
Housing		Homelessness, children, mental health, developmental delays, depression, stability	In extreme cases, unstable housing can lead to homelessness. Studies have shown that homeless children are more vulnerable to mental health problems, developmental delays, and depression compared to children who live in stable housing conditions	64
Housing	✓	Senior citizens, affordability, access, care, supportive services, aging in place, low-income, elderly, education, medical care, safety	Many senior citizens also experience a growing need for supportive health-related services that can be provided through programs linking affordable housing with access to care and supportive services. An evaluation of an aging-in-place program for low-income older adults that offered onsite health education, medical care coordination, health monitoring, and discharge planning found that receiving the onsite services made the residents feel safer and confident they could stay in their homes as they aged.	65
Housing		Density, employment, residential density, light	Many studies have been completed to help determine the relationship between housing densities and viability of transit service. Work by the Transit Cooperative Research Program	66, 67

		rail, cost effective	reinforces thresholds offered by previous research and expands the nature of some thresholds to apply to different types of transit service and to include employment characteristics. More recent work related specifically to rail transit suggests that light-rail systems need around 30 people per gross acre around stations and heavy rail systems need 50% higher densities than this to place them in the top one-quarter of cost-effective rail investments in the U.S.	
Housing		Density, access	Similarly, the University of Minnesota's Design for Health study recommends a residential threshold of an average of more than seven units per gross acre, and all residential or employment areas should be located within three-quarters of a mile of a transit stop. These thresholds emphasize opportunities to access transit service in terms of service locations and times, which are often linked to density. While seven units per acre serves as a threshold, higher densities can produce even greater benefits in terms of accessibility	68
Housing		Neighborhood characteristics, walkability, bicycle, density, job-housing diversity, walkable design, destinations, distance, ridership	A study completed by the California Department of Housing and the California Department of Transportation in 2007 found that there are five neighborhood characteristics that shape whether peoples use public transportation, walk, bicycle, or drive. These factors are commonly referred to as the "5 D's" and they are • Net Residential Density: Denser developments generate fewer vehicle trips per dwelling unit than less dense developments. • Job-Housing Diversity: Having residences and jobs in close proximity will reduce the vehicle-trips generated by each by allowing some trips to be made on foot or by bicycle. • Walkable Design: Improving the walking/biking environment will result in more non-auto trips and a reduction in auto travel (with synergistic effects with Density and Diversity). • Destinations: Households situated near the regional center of activity generate fewer auto trips and vehicle-miles of travel. • Distance: Transit ridership rates among station area residents increase exponentially as the distance to a transit station declines.	69

Housing		Housing quality, children, risk factors, asthma, respiratory illness, injury, building management, intervention, allergens	In a 2007 study, it was found that poor quality housing can affect health by exposing children to risk factors for asthma and other respiratory illnesses, and unintentional injuries. Proper maintenance and building management have proven to be effective interventions. For example, researchers have found that most asthma is associated with exposure to allergens, including those often found in poor-quality housing, such as mold, dust mites, mice and rats, and cockroaches (non-allergic asthma represents only about 20% of cases).	70
Housing	✓	Housing costs, low-income, tradeoffs, health insurance spending, uninsured	Researchers at the Center for Housing Policy, found that when confronted with high housing costs, low-income households may make tradeoffs related to spending on health insurance. In a working paper on the spending habits of insured and uninsured households, Levy and DeLeire (2003) found evidence that "the prices of other goods – most notably housing – may be additional important factors causing some households not to purchase health insurance."	71
Housing	✓	Supply, affordability, low-income, spatial segregation, income, race, ethnicity, social class, unsafe neighborhoods, necessities	Additionally, the inadequate supply of affordable housing for low-income families and the increasing spatial segregation of some households by income, race, ethnicity, or social class into unsafe neighborhoods are among the most prevalent community health concerns related to family housing. When affordable housing is not available to low-income households, family resources needed for food, medical or dental care, and other necessities are diverted to housing costs.	72
Housing		Bicycle, protected lanes, safety, access, cost, compact development, independence, no car household	By helping make bicycle transportation mainstream, protected lanes make travel safer and more accessible—lowering household transportation costs, enabling compact development, broadening individual independence, and increasing the ability for individuals living in no- and low-car households to get to goods and services.	73
Jobs		Economy, income, predictor, disease	The relationship between the state of the economy and health is well documented. Research shows that income is one of the strongest and most constant predictors of health	74

			and disease, and that the strong relationship between income and health is not limited to a single illness or disease.	
Jobs	✓	Washington County, obesity, income, federal poverty level, access, living wage, low-wage	According to research conducted for the Washington County Community Health Improvement Plan, obesity is twice as common among those whose household income is less than 200%of the federal poverty level. This indicates that access to jobs that provide a living wage, not just low-wage jobs, is an important factor of health.	75
Jobs		Unemployment, heart disease	In a study in Sweden involving over 600,000 residents, the neighborhood unemployment rate predicted coronary heart disease risk for the neighborhood's residents, even after controlling for individual demographics and socioeconomic measures.	76
Jobs		Unemployment, premature mortality, cardiovascular disease, hypertension, depression, suicide	Unemployment is associated with premature mortality, cardiovascular disease, hypertension, depression, and suicide.	77, 78
Jobs		Transit service, employment characteristics, density	Work completed by the Transit Cooperative Research Program expanded on previous research to evaluated transit service and employment characteristics. Based on this research, recommended commercial development densities for variable, transit service are presented in Table 3.25.	79
Jobs		Walkability, density	Similarly, research based in King County, Washington found considerable shifts from auto use to transit use and walking with densities between 20 and 75 employees per gross acre and again with more than 125 employees per acre.	80
Jobs	✓	Transit infrastructure, connected networks, capacity, reliability, economic cost, quality of life,	In *Transportation and Economic Development*, similar research finds that high density transportation infrastructure and highly connected networks are commonly associated with high levels of economic development. When transportation systems are efficient, they provide economic and social opportunities and benefits that result in positive multipliers effects	81

		efficiency, social opportunity, positive multipliers, access, markets, employment	such as better accessibility to markets, employment, and additional investments. When transportation systems are deficient in terms of capacity or reliability, they can have an economic cost such as reduced or missed opportunities and lower quality of life.	
Jobs		Vehicle travel, environmental cost	Another study published in the *Journal of the American Planning Association*, indicates that local balance between jobs and housing reduces vehicle travel and associated environmental and health costs.	82
Jobs		Access, employment	Research studying the relationship between transit-based job accessibility and employment outcomes for workers without automobiles found that improved transit-based job accessibility significantly expands both the probability of being employed and the probability of working 30 hours or more per week for autoless workers in San Francisco.	83
Jobs	✓	Poverty, low-wage, low-income, communities of color, black/African American, job readiness, placement	A 2005 study in Buffalo, New York found that black/African American adults in poverty have poorer access to automobiles than whites, and, as a result, they may be able to search for jobs only within a smaller area. This study recommends enhancements to public transit in places with large concentrations of low-wage jobs and increased access to reliable automobiles in places with small concentrations of low-wage jobs. Above all, unemployment rates in low-income neighborhoods suggest a need to enhance programs to improve job readiness, placement and support services.	84
Jobs		Traffic, pollution, long-term exposure, design, quality of life	Motor vehicle traffic is the main source of ground-level urban concentrations of air pollutants with recognized hazardous properties. Approximately 36,000 to 129,000 adult deaths a year can be attributed to long-term exposure to air pollution generated by traffic in European cities. Reviving the concept that the result of urban design should be improved quality-of-life and that where people live as it relates to where they work, shop or go to school can have a dramatic impact on their health and quality of life.	85

Jobs	✓	Welfare, spatial separation, employment services, commute, access	A 2001 study stated welfare participants face a spatial separation from jobs and employment-related services. The analysis shows that welfare participants' access to employment varies dramatically depending on their residential location and commute method. Many welfare participants live in job-rich neighborhoods and are able to reach numerous jobs without difficulty by either car or public transit. Others, however, live in job-poor neighborhoods where a reliance on public transit significantly reduces their access to employment. In these neighborhoods long and unreliable commutes on public transit often severely limit their ability to find and reliably travel to and from work. Therefore, given the distinctly uneven patterns of employment opportunities in metropolitan areas, policies to address the transportation needs of welfare participants should be targeted to reflect the characteristics of the neighborhoods in which welfare participants live.	86
Jobs		Poverty, spatial separation, commute, place-based economic development	As noted in the Journal of Regional Science, poverty rates increase with greater rural distances from successively larger metropolitan areas. This outcome results from the reduced urban density effects at greater distances and incomplete commuting and migration responses to lower labor demand in rural areas. One implication is that remote areas may particularly experience greater reductions in poverty from place-based economic development	87
Safety		Built environment, walking, bicycle, facility, risk	Providing a safe built environment of walking- and bicycle-friendly facilities is a key part in promoting safety. Unsafe traffic mixes of motor vehicles, pedestrians, and bicycles all lead to increased risk of injury and death.	88
Safety		Complete streets	MnDOT published the *Complete Streets Implementation Resource Guide for Minnesota Local Agencies* in 2013. This resource includes an overview on Complete Streets, a brief synthesis of local and national practices, an understanding of the various terms and definitions, guidance on implementation and a summary of agencies in Minnesota with Complete Streets with complete streets policies or other guidance and projects in Minnesota related to Complete Streets.	89

Safety		Bicycle, pedestrian, traveler behavior, built environment, design, ADA compliance, speed, traffic calming, formal design guidelines	Bicycle and pedestrian crashes are the result of many different causes, including disobedient behavior of the traveler (drivers, pedestrians, or bicyclists) and built environments that do too little to protect pedestrians and bicyclists. Too often, streets and intersections are designed mainly to accommodate fast moving automobile traffic. Even if a speed limit is posted at 25 mph, the overall design of a corridor may do little to provide safeguards for walkers or bicyclists. To address this, there are a variety of strategies available aiming to modify features of the built environment to better accommodate those who walk and bicycle, increasing their safety. These strategies can include traffic calming, complete streets, and formal design guidelines such as ADA compliance.	90
Safety		Roadway features, pedestrian, design, traffic calming, crosswalks, medians, driver behavior	Several types of built roadway features were noted to have the best results for promoting pedestrian safety, including marked crosswalks and traffic calming measures. Marked crosswalks, particularly those which are well designed (e.g., with raised medians) and noticeable to drivers, significantly reduce pedestrian crashes. In areas with traffic calming, drivers "read" the potential hazards of the road environment and adjusted their behavior in response, thereby resulting in fewer crashes.	91, 92
Safety		Traffic volumes, pedestrian, cyclist, bicycle, road-injury burden, crash	High traffic volumes increase the risk of pedestrian, cyclist, and motorist injury and death. Pedestrians, cyclists, and motorized two-wheeler users bear a disproportionate share of the global road-injury burden and are all at high risk of crash injury.	93
Safety	✓	MnDOT, Context Sensitive Solutions, CSS, interdisciplinary, mobility, walkability, satisfaction, quality of life	MnDOT provides a number of resources to ensure "context sensitive solutions" are applied to transportation projects. Context Sensitive Solutions is a collaborative interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its settings. Examples of context sensitive benefits include from a safety perspective include improved mobility for users, improved walkability, safety (vehicular, pedestrian, bicyclists), community satisfaction, and quality of life.	94

Safety		Speed, bicycles, pedestrians, traffic calming, context sensitive solutions, design	Vehicle speed is an important safety issue for bicycles and pedestrians. The speed of car and pedestrian/bicycle crashes is an important predictor of severity of injury. Studies have shown that 5%of pedestrians who are struck at 20 mph are killed, 45%at 30 mph, and 85%at 40 mph. Traffic calming and context sensitive design can reduce the extent to which vehicles speed.	95
Safety		Density, collisions, traffic volumes, pedestrians	Research has shown that growth in residential density predicts increases in vehicle injury collisions. This is the case independent of traffic volumes. In addition, if the increase in density along the corridor increases vehicular traffic due to an upsurge in residents or in commercial destinations, then pedestrians will be at a greater risk for collision-related injuries if safety measures are not included. However some research has shown that increases in the number of pedestrians can increase drive awareness and reduce the number of collisions.	96, 97, 98, 99
Safety		Density, transit station, neighborhood design, sidewalk connectivity, traffic calming, bike lanes	Studies from the Transportation Research Board indicate that in addition to density and proximity to transit stops, neighborhood design (e.g., sidewalk connectivity) affects transit use. Areas that have complete sidewalks, buildings oriented towards the street, traffic calming, and bicycle lanes, provide a better experience for people traveling to and from transit stops.	100
Safety		Pedestrian environment, design walkability	A high-quality pedestrian environment can support walking both for practical purposes and for pleasure. Recent studies in the United States have demonstrated that people walk, on average, 70 minutes longer in pedestrian-oriented communities.	101
Safety		Access, children, healthy community, controlled crossings, commute, Safe Routes to School, pedestrian, walking	Providing safe access for children who walk to school is a key consideration for building a healthy community. Parental concerns about the lack of traffic lights and controlled crossings on their child's school route reduce the likelihood that their child will actively commute to school. In an evaluation of a Safe Routes to School program, the presence of pedestrian safety measures at street crossings was associated with a greater likelihood of walking to school for children.	102, 103

Safety		Traffic-related deaths, pedestrian, race/ethnicity, prevention, cultural differences, demographics	To determine traffic-related pedestrian death rates by sex, age group, race/ethnicity, and urbanization level, the Center for Disease Control (CDC) analyzed 2001–2010 data from the National Vital Statistics System (NVSS). The results of that analysis indicated that the overall, annualized, age-adjusted traffic-related pedestrian death rate was 1.58 deaths per 100,000 population. The study noted that strategies to prevent pedestrian deaths should include consideration of the needs of older adults and cultural differences among racial/ethnic populations due to changing demographics.	104
Safety		Crime Prevention Through Environmental Design (CPTED), behavior, criminal acts, built, social, administrative environment, transit	Crime Prevention Through Environmental Design (CPTED) is defined as a multi-disciplinary approach to deterring criminal behavior through environmental design. CPTED strategies rely upon the ability to influence offender decisions that precede criminal acts by affecting the built, social, and administrative environment. An article published by the American Public Transportation Association indicated that the following features were imperative for crime prevention in a transit environment: facility and structural design; landscape design; lighting; fencing; protective covers and coating materials; security hardware; close circuit television and monitoring equipment; public address systems; passenger emergency communication systems; gas detection systems; motion detectors; alarm systems; electronic car readers/access systems; ticket vending machines; photo enforcement; four quadrant gates; and wayside intrusion detection systems.	105
Safety		CPTED, crime prevention, pedestrian, lighting	Another study showed that sensitively deployed street lighting can lead to reductions in crime and fear of crime, and increase pedestrian street use after dark.	106
Safety		Walkability, crime	A U.S. Department of Transportation survey found that half of the respondents would walk or walk more if there were safe pathways and crime was not a consideration.	107

Safety		Design, built environment, natural surveillance, mixed-use, transit facilities, anxiety	A report from the Transportation Research Board found that design of the built environment can create preconditions for information but effective control of the public environment. The design orientation of buildings with windows facing the street can increase natural surveillance by neighbors. In mixed-use and commercial areas, design can improve opportunities for surveillance by introducing storefronts facing the sidewalk. The placement of transit facilities away from desolate areas, and near places where they can be overseen by shop owners or neighbors, the replacement of pedestrian subways with safe, ground level crossings, the elimination of empty alleys, as well as fences and heavy landscaping blocking sightlines can reduce fear and feelings of anxiety. Design can create preconditions for informal but effective control of the public environment.	108
Safety	✓	CPTED, zone, surveillance, criminal, risk, prevention, design, monitoring, lighting, landscaping, security	A National Criminal Justice Reference Service report found that in order to provide maximum control, an environment is first divided into smaller, clearly defined areas or zones, which become the focal points for the application of CPTED elements. These zones are designated as public, semiprivate, or private and an effort is made to design each zone so that persons that use it feel a strong sense of territoriality that will encourage them to take control and defend it. The principal weapon in the protection of a defensible space is surveillance, since criminals are least likely to act when there is a high risk of their actions being witnessed. Open designs that minimize visual obstacles and eliminate places of concealment while encouraging the use of the environment are utilized. Special monitoring equipment is installed in places that are isolated or seldom used. Furthermore, lighting is installed in ways that enhance surveillance and reduce fear. Landscaping is also designed with surveillance in mind: Bushes are kept to a maximum of 3 feet in height, and the lower branches of trees are at least 6 feet off the ground. Finally, physical security measures aim at delaying penetration and thus reducing the probability that crime will occur.	109

Safety		CPTED, physical security, risk, surveillance, design, movement control, access, management, maintenance, defensible space, legitimate users	A University of Huddersfield publication summarized the principles of CPTED as • Physical security - securing buildings and spaces to a level which is appropriate to risk. Where possible products, which are tested to the relevant security standards, should be utilized. • Surveillance - designing building and space to allow both formal and informal surveillance from users of that space and to create a feeling of unease amongst non-legitimate users of the space. • Movement control – limiting access, exit and through movement. • Management and maintenance – ensuring buildings and the surrounding spaces are designed to create a positive image and to ease future maintenance of the space. Securing in place programmed management and maintenance systems. • Defensible space – ensuring that spaces have a clearly defined ownership, purpose and role to enhance feelings of territoriality amongst residents and legitimate users.	110
Safety	✓	Walkability, mixed-use, social capital, car-oriented, neighborhood, social engagement, public transit, community cohesion, land use	Leyden (2003) found that people living in walkable, mixed-use neighborhoods have higher levels of social capital compared with those living in car-oriented suburbs. Walkable neighborhood residents were more likely to know their neighbors, participate politically, trust others and be socially engaged, suggesting that policies and projects supporting walking and public transit use and increasing land use mix, tend to increase community cohesion.	111
Safety	✓	Community involvement, rational choice, risk, territorial appropriation, reward trade-off, empowerment, manageable space	Additionally, community involvement sends a message to potential offenders that a place is 'owned' (involving rational choice/risk to reward trade-offs). This is also called community empowerment, territorial appropriation, or manageable space (Perlgut, 1982).	112

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