BEST PRACTICES

NELSON NYGAARD

CITY OF SPOKANE

This document compiles a series of relevant best practices serving as a toolbox for Spokane as it addresses key mobility and access challenges during the *Transportation Chapter Update* process. The best practices presented on the following pages should be used to spark interest in the Update process and inform opportunities to improve and enhance Spokane's existing transportation system.

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20-MINUTE NEIGHBORHOODS

WHAT IS IT?

A "20-minute neighborhood" is one in which residents and employees can reasonably walk or bike to places and services to meet a number of their daily needs such as transit, shopping, groceries, public services, schools, parks, and entertainment.

WHY DO IT?

Economic development. In cities across the country, a renewed interest in walkable urban neighborhoods has yielded significant reinvestment and economic development over the last 20 years. This growth strategy allows jurisdictions to increase their tax bases and optimize existing infrastructure assets rather than extending services (streets, utilities) to new green field sites.

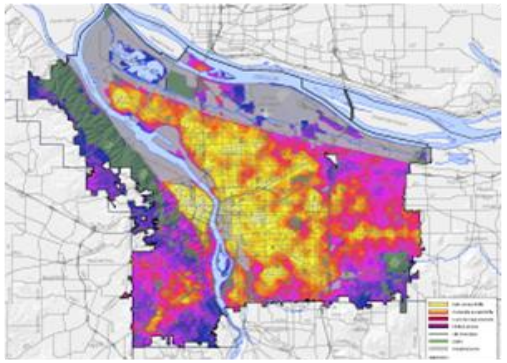
Reduced household driving. 20-minute neighborhoods allow residents and employees to drive less on a daily basis. Consider a downtown employee who is able to complete a number of errands by foot on her lunch hour compared to a suburban office park worker who must drive 1-5 miles to do the same. Over the course of a year (and career), this amounts to significant individual and household savings. From a public standpoint, this reduces congestion and wear and tear on local streets, thereby improving air quality and lowering maintenance costs.

Increased public health. 20-minute neighborhoods promote active forms of transportation including walking, biking and taking transit. Recognizing the connection between the built environment and active transportation rates, local and national organizations are increasingly promoting walkable neighborhoods as an effective public health measure.

HOW WELL DOES IT WORK?

Boise, Idaho. A recent study found that residents of six inland Western cities — including Boise — demand more housing options in neighborhoods where they can walk to schools, parks, shops and other everyday destinations. Of the cities, Boiseans were willing to pay the highest premium (upwards of 45 percent) for housing in walkable neighborhoods.

Portland, Oregon. The 20-minute neighborhood plan is a part of Portland's long-term strategy to manage the challenges that face many cities, including rising energy costs, population growth, roadway congestion, and demand for public transit to connect more and more distant suburbs. After 40 years of promoting transit and pedestrian oriented neighborhoods, it has been estimated that Portlanders drive an average of 4 miles fewer per day than the average American. This translates into an annual savings of $2.6 billion that is more likely to stay within its regional economy.



(Top) The Garland District is an example of an existing 20-minute neighborhood in Spokane.
(Middle) The North End neighborhood in Boise is one of the city's mixed use neighborhoods that commands a 45 percent premium on a housing sales per square foot basis.
(Bottom) To identify areas for improvement, the City of Portland has developed innovative methodology for mapping out its 20-minute neighborhoods.

Images from First Friday on Garland, West Real Estate Group, City of Portland

TRANSIT INNOVATIONS

WHAT ARE THEY?

Today, more forms of public transit are available to cities than ever before. Mid-sized cities throughout the United States are building streetcars, rubber wheeled trolleys, bus rapid transit (BRT), bike share networks, and more.

WHY DO IT?

Transit provides people with options other than driving private cars; it is more cost-effective and less polluting. Standard bus service offers access and mobility throughout Spokane; but innovative transit modes may improve on existing bus service with higher-quality facilities and vehicles, more frequent service, lower emissions, and greater development potential.

Economic development. Spokane developed and thrived along streetcar corridors. New investments in transit like streetcars and enhanced bus services can create magnets for new investments in businesses, retail, and residential development. The Downtown Spokane Partnership President notes that developing new fixed route transit options provides "certainty to the private sector" that supports development.

Transportation options. More transportation options allow people to make travel choices based on time, cost, and preference. Transit options with exclusive right of way outperform standard buses, are often faster than private cars in congestion, and offer a comfortable alternative to other modes. New public transportation options like bike share can extend the range of transit, saving money and helping more people access their daily needs.

HOW WELL DOES IT WORK?

The success of building –and rebuilding – transit across the country has led dozens of cities to plan for enhanced transit.

EmX BRT, Eugene, Oregon. Three years after opening the EmX bus rapid transit (BRT) service in Springfield-Eugene, 42% or 11,000 – of new jobs in the region were concentrated one-quarter of a mile from an EmX station. EmX was one important component in this growth. Daily ridership has increased 74% over standard buses and speeds have increased by 30%.

Portland Streetcar, Portland, Oregon. The first modern streetcar in the United States, the Portland Streetcar has supported more than 5 million square feet of development valued at more than $3.5 billion within two blocks of the alignment. This success has led to an expansion of the streetcar routes to newly developing and redeveloping parts of the city, including the Martin Luther King, Jr. Blvd./ Grand Ave. couplet, a similar environment to Division St./Ruby St.

(Top) Market Street in San Francisco features space for people in cars, on foot, on bike, in buses, and in streetcars. (Middle) The EmX BRT runs along the median of major arterials in Eurgene and Springfield, offering faster, higher-quality service for commuters, students, and visitors. (Bottom) A multimodal transit node in Minneapolis includes rapid bus service stations and and a bike share station.

Images from Nelson\Nygaard

INTEGRATED STREET CONSTRUCTION

WHAT IS IT?

Confronted with changing demands on local streets and diminishing budgets, cities across the country are finding new and innovative ways to cost effectively implement transportation projects. Integrated project construction and low-cost maintenance enhancements are just two avenues cities can employ to satisfy their mobility and community needs. Both require greater inter-agency coordination. This is of critical importance to Spokane as the city is faced with major CSO requirements, increasing roadway maintenance costs, shifting transportation demands, and relatively wide streets that are underutilized.

WHY DO IT?

An integrated approach to street project delivery offers a number of benefits, not only to the community, but also to internal departmental procedures. Major benefits include:

Streamlined project delivery that realizes multiple positive outcomes. Projects of this nature require multi-agency buy-in and input, setting in motion procedures that save cost, time and inconvenience to residents. Likewise, inter-agency coordination that synchronizes street maintenance, bicycle and pedestrian facilities, stormwater integration, streetscaping, and other street improvements all at once helps broadly maximize benefits. At the same time, this approach reduces project administration costs.

Unlocked cost-efficiencies. Annual maintenance projects like overlays require the Public Works department to restripe existing lane markings. With this blank slate opportunity, Spokane can implement planned safety and bicycle improvements at little to no additional cost.

HOW WELL DOES IT WORK?

Seattle. The City of Seattle employs a multi-disciplinary team approach-to project delivery enabling continued collaboration between agencies to weigh in at the beginning of a new project. Seattle has broken down traditional departmental silos between planning, engineering, construction, and maintenance while maintaining continual communication to ensure departments review and inform each level of project delivery—from planning to final design.

Dexter Avenue N in Seattle is an example of all-inclusve design, integrating multimodal facilities, stormwater facilities, and other improvements while generating cost savings. The photos above illustrate the project during and after construction.

Images from Nelson\Nygaard

Santa Monica. In order to fast track implementation of their Bicycle Action Plan and meet their aggressive mode shift goals, the city strengthened inter-agency coordination between their planning and public works departments by coordinating the bicycle plan's project list with the city's 5-year repaving program. This resulted in Plan implementation outpacing the City's phasing strategy for bikeway projects.

MULTIMODAL SAFETY IMPROVEMENTS

WHAT IS IT?

Multimodal safety improvements make walking, biking, driving, and taking transit safer. Improvements consist of bicycle and pedestrian crossings, sidewalks, bicycle facilities along corridors, and traffic calming elements that make all users safer. Crossing improvements include midblock crossings with flashing yield or stop beacons, pedestrian priority signals, sidewalks, and many forms of bicycle facilities. Traffic calming elements that slow motor vehicle speeds also improve safety.

WHY DO IT?

On many streets, current conditions do not allow for safe and comfortable walking and biking; this results in few people choosing to travel by foot or bike and fewer people comfortable choosing transit. Because road have traditionally been designed for speed, motorists often drive too fast. Multimodal safety improvements retrofit streets with spot countermeasures that support safer crossings and connections. Many of these improvements serve multiple benefits for all users while making neighborhoods and city streets more accessible and comfortable. Key benefits include:

Pedestrian safety. Whether we walk or roll, we're all pedestrians at some point of a trip. Improving access and safety for pedestrians can improve health by encouraging walking and allow people to experience their communities in new ways. Retrofits like flashing beacons, median pedestrian refuges, and pedestrian-oriented street lighting support these benefits.

Safety on constrained corridors. Often the public right-of-way is constrained, leaving little room for all modes. Strategies like climbing bike lanes, shared shoulder markings, and "sharrows" help improve access to these streets for vulnerable users.

HOW WELL DOES IT WORK?

Safety improvements are numerous, as are the benefits. According to the Federal Highway Administration, simple changes like pedestrian signal heads reduce crashes by more than 25%; pedestrian only phases reduce crashes by more than 30%; and midblock signals reduce crashes by up to 50%. Other small changes like advance stop bars before intersections reduce vehicle encroachment in crosswalks by up to 75%. Sidewalks reduce crashes by almost 90% while proper pedestrian lighting reduces crashes by almost 80%.

Flashing pedestrian beacons, Tucson, AZ. A city with numerous multilane arterials, Tucson committed to improving pedestrian safety with a number of arterial crossings using demand responsive flashing beacons and other improvements. With more than 60 beacons installed, Tucson has found a 29% reduction in total crashes and a 69% reduction in pedestrian crashes.

(Top) A wide, raised crosswalk in Redwood City, CA features stop bars for drivers, flashing beacons, and is located in the middle of a long block.
(Middle) A pedestrian-friendly "porkchop" islands along a major arterial in the Denver region instructs drivers to yield to pedestrians and people on bicycles and allows safer crossing.
(Bottom) An excess travel lane was removed from this bridge to allow room for people on bicycles and on foot without building new sidewalks.

Images from Nelson\Nygaard and flickr.com/citymaus (bottom)

ROAD DIETS: RIGHT-SIZING STREETS

WHAT IS IT?

A road diet is a street improvement that reduces the width or number of travel lanes in order to accommodate facilities for other non-automobile streets users. Road diets are often achieved by converting a 4-lane street into 2- or 3-lanes plus bike lane and/or a center turn lane. This reduces crossing distances, vehicle speeds, and the number of travel lanes pedestrians must negotiate when crossing.

WHY DO IT?

Generally, road diets yield substantial improvements to street user safety, non-motorized access to local businesses, and redevelopment potential, while exhibiting small if not positive traffic impacts. Cities are implementing road diets to:

Improve traffic efficiency. Eliminating a travel lane to improve traffic efficiency is a counterintuitive outcome of road diets. Taking away lanes often improves traffic flow by eliminating weave movements and left-turn queuing.

Enhance the walking and bicycling environment. Road diets reduce speeding and make vehicle movements more predictable while shortening crossing distances for pedestrians, usually through curb extensions or median islands. In addition, road diets often shift space from travel lanes to create bike lanes, where there were none before.

Improve auto safety and traffic flow. Less speeding improves safety for motorists and passengers, and providing left-turn pockets allows through traffic to proceed without shifting lanes or waiting behind turning vehicles.

Save money. In an era of lean budgets, road diets are a cost-effective improvement that can be implemented quickly.

HOW WELL DOES IT WORK?

Road diets are being used across Washington for a variety of positive outcomes without significant traffic impacts.

Fourth Plain Boulevard (Vancouver, WA). Fourth Plain in Vancouver is a principal arterial carrying 17,000 vehicles per day and a large volume of freight trucks. Serving as the primary connection between major destinations, neighborhoods, and employment centers, the street observes significant demand for cars, transit, bikes, and pedestrians alike. Fourth Plain Boulevard was converted from a four lane cross section to a street providing two travel lanes, a continuous left-turn lane, and bike lanes to accommodate the multiple demands on the street. The project reduced collisions by 52% and speeding reduced by 18% with no impact on traffic operations or diversion. The street was formerly an inhospitable environment for people walking and bicycling. Since implementation of the road diet walking and bicycling activity have increased.

Fourth Plain Blvd in Vancouver was recently converted from four general travel lanes to two travel lanes, a left-turn lane, and bike lanes. The road diet dramatically improved safety, bicycle and pedestrian conditions, and traffic efficiency.

Images from City of Vancouver, WA

INTEGRATING STORMWATER MANAGEMENT INTO STREETSCAPES

WHAT IS IT?

Stormwater management systems help keep rivers clean and streets clear of flooding. Traditional components of the system include storm drains, combined sewer pipes, and water treatment facilities. Integrating "bioswales," permeable paving, narrower streets, street trees, vegetated medians and planning strips, and "storm" or "rain" gardens that absorb runoff into transportation projects make for multitasking streets. These designs help capture water before it enters storm drains, protecting the environment and saving money, as well as calming traffic and fostering attractive streetscapes.

WHY DO IT?

Traditional stormwater management collects runoff in pipes, discharging excess water, untreated, into the river. By incorporating stormwater management into the right-of-way through integrated strategies water is absorbed on-site.

Minimize runoff. Low impact development in Spokane reduces flooding and keeps pollutants out of the river.

Create attractive streetscapes. Stormwater is managed on-site, helping green the streetscape with vegetated areas and street trees.

Calm traffic. Designs for multitasking streets often use elements like bioswales and street trees to reduce traffic speeds.

Save money. Stormwater treatments in the right-of-way helps reduce capital investments in large combined sewer overflow (CSO) tanks and treatment facilities.

HOW WELL DOES IT WORK?

From small treatments like bioswales to rebuilding entire corridors, cities around the country have successfully reduced their overflow and costs by integrating stormwater management designs into streetscapes:

Living Streets, North St. Paul, MN Living Streets are narrow neighborhood streets with room for all road users. Stormwater management elements include bioswales and permeable surfaces that reduce runoff by 90%. North St. Paul combines Clean Water funds with transportation dollars to maximize funding- and impact.

Street Edge Alternative (SEA) pilot, Seattle, Washington. This drainage system has reduced the total volume of stormwater leaving the street by 99% with only an 11% reduction of impervious surfaces. The "soft edges" created by street trees, permeable parking strips, and other elements that help slow traffic speeds on this residential street.

(Top) On Clay St. in Portland bioswales have been incorporated with pedestrian and bicycle bulb outs that increase safety and livability.
(Middle) A bioswale is incorporated into a bike lane, removing one parking spot and improving visibility for all road users.
(Bottom) The Street Edge Alternative pilot project in Seattle incorporates vegetated "soft edges," permeable parking strips, and street trees to manage runoff and calm traffic speeds.

Images from Nelson\Nygaard(top), Nelson\Nygaard(middle) and Google Maps (bottom)

NEIGHBORHOOD GREENWAYS

WHAT ARE THEY?

Neighborhood greenways are low speed, low traffic, and low stress neighborhood streets that prioritize pedestrian and bicycle access and enhance neighborhoods with attractive stormwater facilities, verdant plantings, and lighting among other improvements. Geared toward riders of all ages and skill levels, neighborhood greenways create a livable street environment for pedestrians, bicyclists, and vehicles as well as for active and passive recreation. Neighborhood greenways provide a variety of features designed to manage stormwater, reduce vehicle speeds and volumes, improve network legibility, and prioritize and facilitate pedestrian and bicycle crossings. Spokane's grid system and extensive network of residential streets is fertile ground for significant and low-cost bikeway expansion.

WHY DO IT?

Building neighborhood greenways are a cost effective way to increase walking and bicycling, while enriching neighborhoods. Cyclists typically go out of their way to access neighborhood greenways—particularly women and less experienced cyclists.[1,2] Other key benefits of constructing neighborhood greenways include:

Improved safety and comfort for all users. Improved arterial crossings and enhanced access for people walking and biking, while the street segments are designed to reduce motor vehicle speeds. This creates a safe environment for all users.

Enhanced neighborhood livability. Neighborhood benefits include reduced noise, auto speeds, and cut through traffic as well as creating linear park spaces. Neighborhood greenways are also proven to increase residential property values [3]

Connect neighborhood destinations. Neighborhood greenways provide comfortable, direct, and human-scaled transportation and active recreation corridors. Their convenience is matched by their pleasant nature and comfort.

HOW WELL DOES IT WORK?

Tabor to the River (Portland, OR). A particularly relevant best practice for Spokane is Portland's Tabor to the River neighborhood greenway project, due to its stormwater integration and innovative funding tie-in. Portland has the most extensive neighborhood greenway network in the US. Comprising less than 5% of the city's bikeway network, it accommodates over 10% of all bicycle trips. The Tabor to the River neighborhood greenway project is a model for integrated neighborhood greenway design, using stormwater funding for construction. The project created linkages to several neighborhood centers and included stormwater facilities to treat runoff.

Neighborhood greenways are intentionally designed as pleasant streets for people to walk and bike along. They include features that manage auto speeds and limit atuo cut-through traffic (a popular feature for residents), while expanding storwater runoff capacity for cities with major or prolonged rain events.

Images from Nelson\Nygaard

CATALYTIC STREETSCAPE INVESTMENTS

WHAT ARE THEY?

Catalytic streetscape investments leverage transportation and related funds to stimulate business growth and help revitalize corridors. Investments range from the small: street furniture like benches and potted plants to large: full corridor redevelopment across the right-of-way including new sidewalks, vegetated space, and on-street improvements.

WHY DO IT?

Transportation elements influence the appearance and economics of neighborhoods. From overhauling a main street with a road diet and pedestrian improvements to making small walkable residential streets where all users share space, investments in transportation infrastructure can re-enliven places.

Safer, multimodal streets. Even with no elements of economic development, streetscape improvements that provide for more multimodal streets create places that people on foot and on bike are more comfortable and where people in cars and using transit are safer and can access the services they need.

Spur private investments. Public spending on transportation sends the message that the City is dedicated to making vibrant places; this catalyzes private development and may encourage further revitalization efforts.

HOW WELL DOES IT WORK?

Around the country, cities are rebuilding and rebranding their cores from the ground up. Transportation projects create the base that private and public development can build upon:

Lower Downtown (LoDo), Denver. By the middle of last century what was once a thriving business area became a neglected part of the city. The area has been revitalized with new stores, housing, and restaurants. Small and large transportation investments like rebuilt wide sidewalks, landscaping and lighting, the 16th Street pedestrian and bus mall, the new Union Station, and the Commons Park are bringing the district vibrancy and transit links to the region.

The BLVD, Lancaster, CA. A decaying arterial was re-imagined as an exciting pedestrian-oriented place. Lancaster's investment in a streetscape redesign included a "road diet" that narrowed the five lanes to two and included a median park dubbed a "ramblas" after Barcelona's iconic public spaces. The City's investment has spurred more than $300 million in private investment and has revitalized the area.

(Top) The Third Street Promenade in Santa Monica converts a unwelcome arterial into a pedestrian and business friendly street.
(Middle) The 16th Street pedestrian and bus mall connects downtown Denver to the LoDo district.
(Bottom) The BLVD in Lancaster, CA was once a drab five lane arterial with limited commercial activity. Now it is the town's central meeting place.

Images from Nelson\Nygaard(top), Nelson\Nygaard (middle) and City of Lancaster (bottom)

SUPER STOPS

WHAT IS IT?

Transit "Super Stops" are locations where multiple transit services meet that provide for a convenient transfer between services. Ideally, these locations connect passengers with community activity centers and make transfers a more pleasant experience. Super Stops often feature larger, clean, well-lit shelters with seating; comprehensive electronic traveler schedule, real-time arrivals, and information displays; fare payment systems; and may be located near supporting retail. Quality connections and safe access such as improved crossings, multi-use path connections, and wayfinding aids make Super Stops easier to access.

WHY DO IT?

Significant value for low cost. Featuring more amenities than standard bus stops, Super Stops facilitate transit connections and create a sense of place and permanence for the development community.

Improved accessibility and safety. Intersecting services can more than double the influence of accessibility investments like curb extensions, crosswalks, and crossings upgrades. These improvements also improve safety for passengers.

Increase passenger security. Incorporating natural surveillance and good lighting, Super Stops offer good visibility, shelter, and lighting that help people feel more secure.

HOW WELL DOES IT WORK?

RTC, Las Vegas, NV. Bus stops along the MAX BRT route feature connections to feeder buses, crossing improvements to help people access local business and neighborhoods, and state-of-the-art bus stops with shelters, and self-service ticket booths.

MAX, Kansas City, MO. The MAX BRT utilizes a variety of bus stop designs, most featuring 18-foot markers for easy identification on and off the bus, modern shelters have roofs that are 80% opaque to provide shade in the summer and allow some light in the winter, and real-time arrival signs and traveler information at all stops.

(Top) Kansas City's MAX Station at night features well-lit places to sit and information that is easy to read.
(Middle) A Las Vegas MAX bus stop features coverage, comfortable seating, and a ticket kiosk.
(Bottom) Passengers wait for a MAX bus in Kansas City. Stops feature covered seating, information boards, easily identifiable markers, and proximity to key locations.

Images from Nelson\Nygaard

INSTITUTIONAL TRANSPORTATION DEMAND MANAGEMENT

WHAT IS IT?

Transportation Demand Management (TDM) is a general term for coordinated policies and strategies that increase overall system efficiency by encouraging a shift from single-occupant vehicle (SOV) trips to non-SOV modes, or shifting auto trips out of peak periods. Institutional TDM focuses these strategies on establishments such as hospitals and universities that are large employers and generate a high number of trips. Institutional strategies include managing parking demand; programs that promote transit use and carpooling; and improving access for walking and biking.

WHY DO IT?

TDM can be an efficient way to reduce SOV trips and their associated economic, public health, and environmental costs.

Cost-effective. TDM strategies save employers and employees money, putting more money in people's pockets and helping institutions grow. According to AAA driving cost figures, current TDM efforts in Spokane save employees $9.8 million a year.

Future-oriented. Coordinated institutional TDM strategies are an excellent way for employers to comply with Washington's statewide Commute Trip Reduction (CTR) law and manage demand today for projected growth in the future.

HOW WELL DOES IT WORK?

While each city and institution faces unique challenges, in most every example coordinated TDM programs have saved employees, employers, and cities time and money:

Seattle Children's Hospital. Offering employees a parking cash-out of $50/month, a Commuter Bonus for people that get to work by non-SOV modes, a universal transit pass called a FlexPass, showers/locker rooms, commute assistance counseling for all new employees, a bike share program, and various events have resulted in a drive-alone rate of 38%, down from 73% in 1995. The hospital has saved on improved health of employees and improved relations with the nearby community.

U-PASS Program, King County and the University of Washington. The University of Washington's 20-year old U-PASS program is a universal transit pass issued to every student at a significant discount. Together with parking management, efficient land use, education programs, and improved multimodal access, the program has become a national model. While the University community is 30% larger than it was in 1992, traffic volumes in the University District are lighter today.

(Top) Transportation and health fairs help employees learn about alternatives to driving alone and TDM programs.
(Middle) A large corporate headquarters features a transit hub where employees can access shuttles, parking and transportation information, securely park bicycles , and access locker rooms.
(Bottom) Carpool and electric vehicle drivers receive prefered parking close to the entrance of this employer.

Images from Nelson\Nygaard

REALIGNING SKEWED INTERSECTIONS

WHAT ARE THEY?

Intersections present a number of conflicts between modes. Less complex, more compact intersections can limit conflicts and improve safety for all users. Yet, not all roads converge at right angles. Skewed intersections, such as those along Indian Trail Road or Northwest Boulevard, which when viewed from above form the shape of an "X," present varied urban designs but may make for a less safe auto, pedestrian and cycling environment. For this reason, some municipalities have altered their skewed streets by squaring off intersection legs into right angles or by creating a series of T-intersections.

WHY DO IT?

Intersections are common sites of automobile, pedestrian, and bicycle interfaces and collisions. Studies from the *Crash Modification Clearinghouse* show that vehicle crashes decrease when a skewed four-leg arterial intersection is converted to two three-leg intersections. Creating intersections at or near 90 degrees can improve safety in a number of ways.

Shorter crossing distances. Pedestrians and cyclists crossing through a skewed intersection will face longer crossing time than in a more compact intersection, thereby increasing exposure to collision. Moreover, automobiles face increased exposure to on-coming traffic when turning. Designing intersections with shorter crossings can improve safety for all users.

Reduced vehicle speeds. A redesigned intersection can include curb extensions, pedestrian refuges, and landscaping. These added safety elements encourage slower speeds and create a more drivable, walkable and bikeable environment.

Improve visibility. Modifying intersections with less acute angles will not require road users to turn their heads as much to gain an adequate line of sight. This may be particularly important for older or disabled road users.

HOW WELL DOES IT WORK?

Realigning skewed intersections by either squaring off the roads into right angles or creating separate T-intersections has benefited several municipalities.

Portland, OR. Numerous intersections along Portland's Sandy Boulevard have been redesigned to promote bicycle and pedestrian safety. The addition of rapid flash beacons has supplemented the safety improvements to these intersections.

Cambridge, MA. The intersection at Lafayette Square, a once complex intersection of four roads at a skewed angle, was simplified by squaring off Columbia Street. A plaza and enhanced bicycle and pedestrian facilities were also added.

Skewed intersections, such as the Northwest Boulevard and Alberta Street intersection in Spokane (top), create long crossing distances and reduced visibility. These challenges can be mitigated by squaring off street connections into right angles, as seen in the realigned intersection in Cambridge, MA.

Images from Google Maps.

MULTIMODAL CONNECTIONS

WHAT ARE THEY?

Certain sections in the road network, such as bridges and cul-de-sacs, bring connectivity challenges for all road users. Redesigning bridges to accommodate cyclists and pedestrians is one way to ensure those opting for non-motorized transportation can safely and efficiently arrive at their destination. Cul-de-sacs and other dead end streets can be improved by designing small cut-throughs for cyclists and pedestrians. The Spokane River presents some connectivity challenges for non-motorized access, particularly across the Maple Street Bridge and the Sunset Bridge. Moreover, development policies that lead to cul-de-sacs and dead end streets have further complicated access for road users.

WHY DO IT?

Many road users choose to cycle or walk for convenience. Without well-situated linkages to downtown and other neighborhoods, potential cyclists and pedestrians will likely choose a mode that affords them a faster or more direct path.

Bridges. Because of the limited right-of-way on bridges, many municipalities do not design bridges for all modes. Yet, bridges are important gateways to neighborhoods and links to commercial districts. Automobile lane right-of-ways can be slimmed to ten feet to allow for a minimum sidewalk width of five feet. Dedicated bicycle right-of-ways are usually the best option for cyclists, but bridges with slower traffic may only require shared lanes with sharrow markings.

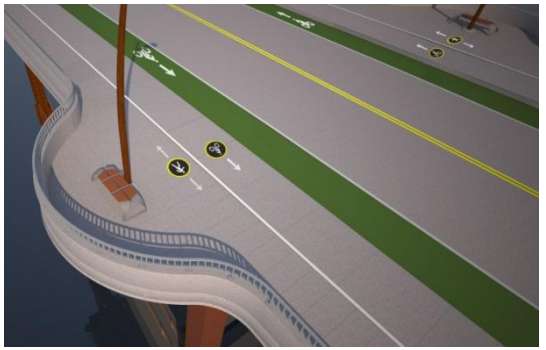
Pedestrian cut-throughs. Cul-de-sacs and dead ends reduce street connectivity for all users, but they are most punitive to pedestrians and cyclists. Whereas building a right of way for cars may not be an option, constructing a path for pedestrians and cyclists may be worth pursuing. Prime locations for such cut-throughs include areas near transit stations or schools.

HOW WELL DOES IT WORK?

Depending on the type and location of the facility, the transportation enhancements can offer improved access to neighborhoods and commercial corridors.

Portland, OR. The new Sellwood Bridge will accommodate bicycle and pedestrians with lanes on both sides of the automobile lanes. The connection will reduce travel times between southeast Portland and downtown.

Olympia, WA. The Neighborhood Pathways Program connects schools and other amenities by constructing bicycle and pedestrian paths at existing dead end streets. The program also encourages such connections on new developments.



Once a dangerous bicycle crossing, Portland's Sellwood Bridge has been redesigned to accommodate cyclists and pedestrians, offering more direct access to downtown (top). The City of Olympia's Neighborhood Pathways Program links neighborhoods through bicycle and pedestrian paths (bottom).

Images from Multnomah County (top) and City of Olympia (bottom)

URBAN INTERCHANGES

WHAT ARE THEY?

In rural areas, access between two intersecting highways is often provided by grade-separated cloverleaf intersections that do not impede traffic flow. In more urban areas, or at junctions with development where people need access to destinations, such interchanges encourage high speeds, which degrade access for all modes. Urban interchanges, including roundabouts and urban diamonds, are context-sensitive ways of moving traffic. These context-appropriate solutions are potentially applicable where arterials and collectors intersect with surface highway interchanges, such as Thorpe Road and Hwy 195.

WHY DO IT?

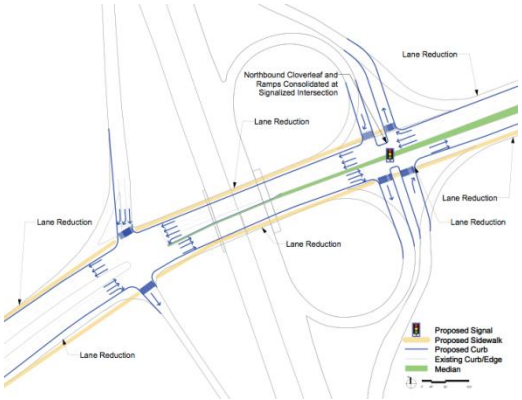
Urban diamond. Tight urban diamond interchanges (TUDI) typically operate on a four-phase signal cycle that can be optimized for traffic flows if desired. In areas with varying left turn volumes, TUDIs work better than Single-Point Urban Interchanges.[1] Urban diamonds and roundabouts reduce the interchange footprint size.

Roundabout. Roundabouts, especially one-lane roundabouts, have been shown to increase safety because they 1) reduce conflicts compared to a typical four-leg intersection 2) encourage lower and more consistent speeds, since drivers are not rushing to beat the light and 3) have splitter islands allowing pedestrians to cross one direction of traffic at a time.[2] Modern roundabouts typically have a much lower design speed than older traffic circles of 15 mph rather than 25 mph, which naturally enforces yielding to pedestrians and allows cyclists to merge into traffic.[3] Since there are no traffic signals to maintain, roundabouts can reduce operations costs by $5,000-$10,000 per year.[4]

HOW WELL DOES IT WORK?

Urban diamonds provide more efficient, safer connections. At grade-separated interchanges, urban diamonds square off-ramps up to local access roads with signals, creating two intersections spaced 200-400 feet apart. Urban Diamonds work well in locations where right-of-way is not available for larger interchanges, traffic is light on the minor street, and there is desire to slow traffic speeds entering a community. WSDOT adopted tighter interchange designs for Seattle's SR-520 bridge reconstruction.

Roundabouts can increase safety. Roundabouts work well at multi-leg intersections, community gateways, and as a potential mitigation for high-crash locations. They often include landscaping or community amenities (seating, art) in the center with the edge of the circle designed as mountable for trucks and emergency vehicles. At roundabout entrances, use zebra crossings and/or signage to enforce yielding to pedestrians. Splitter islands at each entrance point create a two-stage cross for pedestrians.



A grade-separated interchange near a pedestrian generator can be transitioned to a signalized urban diamond in Richmond, VA. At a complex five-way intersection in Glens Falls, NY, a roundabout eases congestion.

Images from Nelson\Nygaard (top) and Flickr (bottom)